Vol. 91, No. 24 New York, June 16, 1928 *Pages 1277-1326*

L. W. W. Morrow, Managing Editor
Earl Whitehorne, Commercial Editor
Allen M. Perry, Associate Editor
G. F. Wittig, Statistical Editor
H. M. Cameron, Financial Editor
F. C. Wells, News Editor
Eustace C. Soares, Manufacturing and Markets Editor

Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

W. H. Onken, Jr., *Editor*

Frank R. Innes and T. P. Kindig, Western Editors, 7 South Dearborn St., Chicago
H. S. Knowlton, New England Editor, 88 Tremont St., Boston
Walter C. Heston, Pacific Coast Editor, 883 Mission St., San Francisco
E. R. Shaeles, Assistant Editor
Paul Wooton, Washington Correspondent, National Press Bldg., Washington

Contents of This Issue

Editorials 1277

Frontispiece—Long Beach Steam Plant Nears Completion 1280

Surge Tests on Isolated Neutral Network 1281
By R. Rader and V. B. Wilfley
Klydonographs showed 26 per cent of surges on 55-kv. system to be above three times normal voltage.

Cost of Fuel-Handling Equipment 1284

The Trouble with Buying 1285
By Earl Whitehorne
The basic causes of price cutting. Where the seller and the buyer are responsible. Three things to do about it and two recommendations for a course of action.

Analysis of Twenty Utility Companies Handling Over 100,000,000 Kw.-Hr. in 1927 ... 1188

Electric Enameling Used in Packard Plant 1289
By R. J. Gaudy
Ovens for continuous process effect large savings over batch method. Use of filtered air in counterflow to work assures quality of product and economy of heat.

Multi-Speed Pump Control Maintains Water Level 1292
By L. Stone

Flushing Condenser Tube Sheets 1293

Protection of Control Circuits 1293
By John H. Nelzen

24 Points on Range Selling 1294

Taxes About 9.6 per Cent of Revenue 1296

Draining High Voltages from Lines 1297
By Charles E. Bennett

Lighting Rural Highways 1300

The New 10-Watt Lamps and Central-Station Revenue 1300
By M. Luckiesh

Refunding Customers' Deposits 1301
By J. W. Williams

Century Electrically Anneals Lamination Sheets 1301

Financing Street Lighting 1302

Fundamental Economics of Rural Service Declared 1302

Letters from Our Readers 1302

Digest of Electrical Literature 1303

News of the Industry 1305
- Court Decisions, Commission Rulings 1312
- Men of the Industry 1313
- Financial and Statistical 1315
- Business News and Market Conditions 1319
- New Equipment Available 1323
- Electrical Patents 1324

Business Facts for Electrical Men 1325

Statistical Reprints Available

COPIES of the following statistical articles published in the Electrical World are available and may be obtained, until the supply is exhausted, by addressing the statistical editor:

Title	Date Originally Published
Statistics on prime movers, generators and motors in American manufacturing plants as of Jan. 1, 1926	Aug. 13, 1927
Power in American industry (eight pages of charts)	Oct. 1, 1927
Cities and towns served by electricity total 17,622 (statistics by states and size of town)	June 12, 1926
Annual statistical review (selected statistics reprinted from the Annual Statistical Issue)	Jan. 1, 1927
Electrical manufactures in 1925	April 30, 1927
Trends in electrical costs	Jan. 1, 1927
An industry balance sheet	May 8, 1926
Industrial load of the United States	Jan. 2, 1926
Industrial load of New England	Dec. 19, 1925
Similar analyses of industrial load as of Jan. 1, 1924, are available for each region.	
Engineering details of transmission lines (a detailed tabulation of 777 lines in the United States)	Jan. 3, 1925

McGRAW-HILL PUBLISHING COMPANY, INC.
Tenth Ave. at 36th St., NEW YORK, N. Y.

James H. McGraw, President
James H. McGraw, Jr., V.-Pres. and Treas.
Malcolm Muir, Vice-President
Edward J Mehren, Vice-President
Mason Britton, Vice-President
Edgar Kobak, Vice-President
C. H. Thompson, Secretary

New York Dist. Office, 285 Madison Ave.
Washington, National Press Bldg.
Chicago, 7 South Dearborn St.
Philadelphia, 1600 Arch St.
Cleveland, Guardian Building
St. Louis, Bell Telephone Building
San Francisco, 883 Mission Street
London, 6 Bouverie Street, London, E. C. 4

Cable Address "Machinist, N. Y."
The annual subscription rate is $5 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala, Haiti and Paraguay. Extra postage to other countries $4 (total $9 or 38 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 25 cents.
Change of Address — When change of address is ordered the *new* and the *old* address must be given. Notice must be received at least ten days before the change takes place.

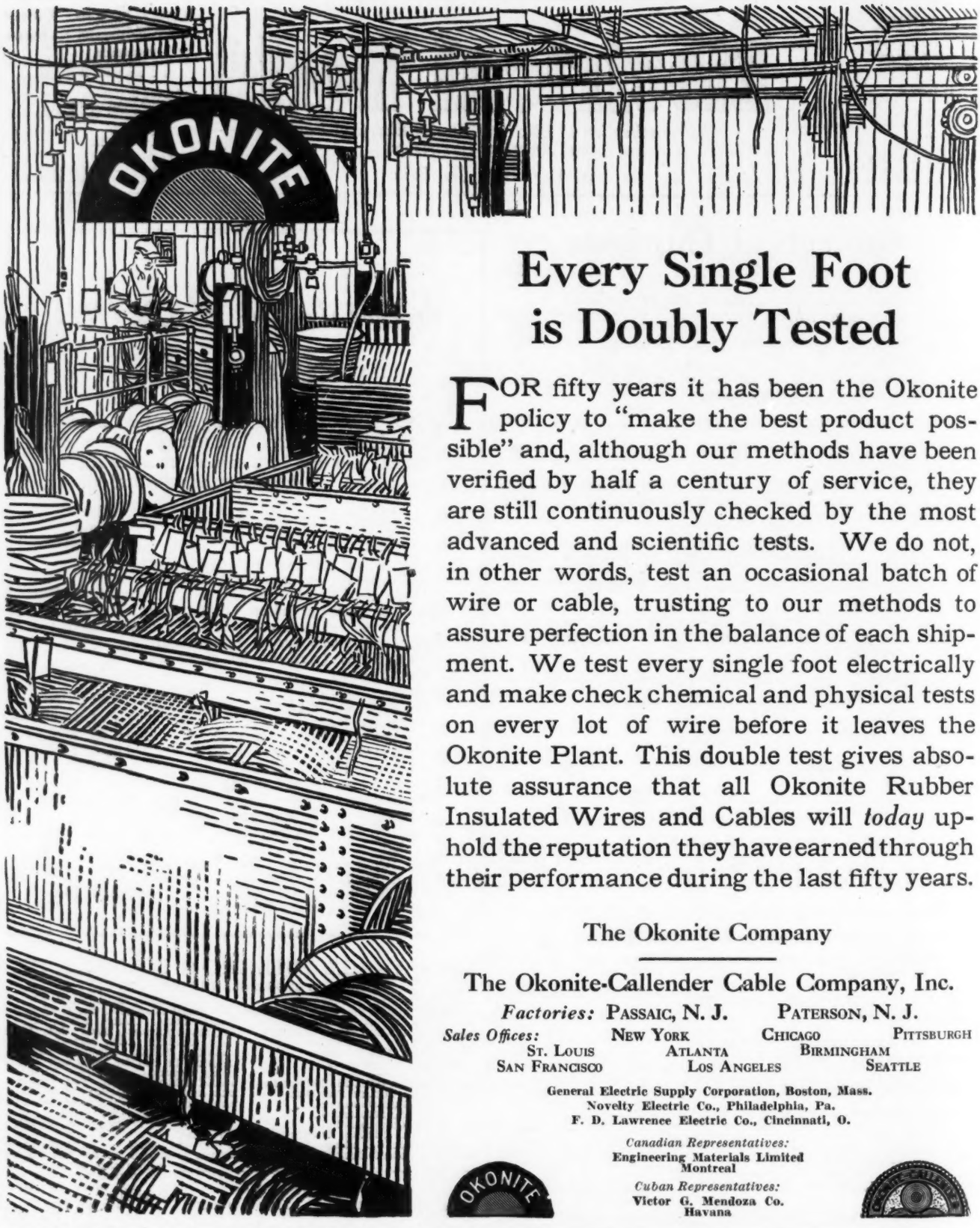
Publishers of
Engineering News-Record, American Machinist, Power, Chemical and Metallurgical Engineering, Coal Age, Engineering and Mining Journal, Electrical Merchandising, Ingeniería Internacional, Electric Railway Journal, Bus Transportation, Construction Methods, Electrical World, Radio Retailing, Electrical West (*Published in San Francisco*), American Machinist—European Edition (*Published in London*)

Copyright 1928 By McGraw-Hill Publishing Company, Inc.

Published weekly
Entered as second-class matter Jan. 20, 1907, at the Post Office at New York, N. Y., under the Act of March 3, 1879.
Printed in U. S. A.
Circulation of this issue, 19,200

Member Audit Bureau of Circulations
Member Associated Business Papers, Inc.

Advertising Index—Alphabetical, 72; Classified, 66, 68, 70; Directory of Engineers, 34, 35; Searchlight Section, 36-40



Every Single Foot is Doubly Tested

FOR fifty years it has been the Okonite policy to "make the best product possible" and, although our methods have been verified by half a century of service, they are still continuously checked by the most advanced and scientific tests. We do not, in other words, test an occasional batch of wire or cable, trusting to our methods to assure perfection in the balance of each shipment. We test every single foot electrically and make check chemical and physical tests on every lot of wire before it leaves the Okonite Plant. This double test gives absolute assurance that all Okonite Rubber Insulated Wires and Cables will *today* uphold the reputation they have earned through their performance during the last fifty years.

The Okonite Company

The Okonite-Callender Cable Company, Inc.

Factories: PASSAIC, N. J. PATERSON, N. J.

Sales Offices: NEW YORK CHICAGO PITTSBURGH ST. LOUIS ATLANTA BIRMINGHAM SAN FRANCISCO LOS ANGELES SEATTLE

General Electric Supply Corporation, Boston, Mass.
Novelty Electric Co., Philadelphia, Pa.
F. D. Lawrence Electric Co., Cincinnati, O.

Canadian Representatives:
Engineering Materials Limited
Montreal

Cuban Representatives:
Victor G. Mendoza Co.
Havana

OKONITE

OKONITE PRODUCTS

OKONITE INSULATED WIRES AND CABLES
OKONITE INSULATING TAPE
OKONITE CEMENT
VARNISHED CAMBRIC CABLES
MANSON & DUNDEE FRICTION TAPE
OKOCORD
OKOLOOM

OKONITE-CALLENDER PRODUCTS

IMPREGNATED PAPER CABLES
SUPER-TENSION CABLES
SPLICING MATERIALS

Electrical World

McGraw-Hill Publishing Company, Inc.
JAMES H. MCGRAW, *President*
EDGAR KOBAK, *Vice-President*

W. H. ONKEN, JR.
Editor

VOLUME 91 — *New York, Saturday, June 16, 1928* — NUMBER 24

Unfair Conduct of the Utility Investigation

DISTORTION of the acts and motives of the various committees on public utility information by the Federal Trade Commission and its serious reflections on the electric light and power industry suggest the desirability of a radical change in the conduct of the hearings being held in Washington. No man should be subjected to the kind of examination meted out by the commission without also being heard in his own defense. Common justice demands it, and the public utilities should see to it that the men summoned to testify are not cast to the lions, but have their rights defended by competent counsel.

Enough has already developed in these Federal Trade Commission hearings to indicate that an inquisition is being conducted and that the commission is both judge and jury in the case. Justice may in the end prevail, but meanwhile innocent persons are being maligned and an outstanding and public-spirited industry, smeared with the vilest calumny. Must this be endured in the United States? Is there none to say, "Enough of this malicious misrepresentation"? Shall the rights of citizens be denied them by a federal bureau? It is time to administer a rebuke and time also for the public utility industry to contend boldly and resolutely for its right to defend itself against being forced into the position of a criminal from whom confession is extorted when its real attitude is that of a candid witness with nothing to conceal, eager and unafraid to publish the truth.

* * * *

Duty of Engineers to Go to the Aid of Congress

POCKET veto of Muscle Shoals and the failure of Congress to pass on Colorado River except to make provision for an examination by an engineering board may be accepted by the electric light and power industry as a respite, but the situation is far from that. Granting that a board of high-grade and impartial engineers is appointed to pass on the plans for the Colorado River dam at Boulder Canyon—and the industry asks for nothing more—the Swing-Johnson bill with all its menacing features will be up again for consideration next December. Its passage or defeat then will depend somewhat on the report of the engineering board, but also on the attitude of the country toward the proposition of government in business. Hence the importance of painting and keeping ever before the eyes of the public, and especially of industry, a picture of what government in business means.

With reference to Muscle Shoals, the evident incompetency of the government to handle the development satisfactorily should cause the electric light and power industry some concern. Between now and December an effort should be made to find a workable solution of the problem which has perplexed Congress so long. True, Congress has not shown much ingenuity or flexibility in its handling of Muscle Shoals legislation; but why expect economic or engineering sense from legislators? It is the duty of those who are expert in such matters to help Congress toward a solution, and inasmuch as Muscle Shoals has resolved itself into a power development, the obligation to help lies heavily on the power industry. Congress having tried and failed, our engineers and executives should unselfishly show it the way.

* * * *

Friendly Neighbors

THE secret of good public relations lies in the Golden Rule. It is unreasonable for any business organization to expect the members of a community to be friendly and of an understanding and patient spirit if it does not make a sincere and consistent attempt to be neighborly with them. To have friends a man must prove himself friendly. He must, if he is to be widely welcome, possess a sincerely responsive personality. There is no hidden charm or fetish about public esteem, nor is it likely to be acquired through an excess of conscious effort. Our friends often admire us for qualities not knowingly possessed or cultivated.

Utility-owned tracks and buses that hog the road, metermen who are tongue-tied before civil questions, linemen who endeavor to prove the possession of "hard-boiled" characteristics, and elevator starters whose brains are subject to unconscionable delay in replying to a customer's inquiry, have no place in building friendships. Electric light and power companies serve many masters of high and low degree, but they should never forget that human nature is so formed that individuals seldom resent the compliment of being treated as though they were a bit better, a bit more intelligent, a bit wealthier, a bit more influential than they really are—or if you prefer—than you think them to be.

* * * *

The Association's Pledge in Aid of Research

ACTION by the National Electric Light Association at Atlantic City last week whereby it virtually pledged itself to contribute three million dollars for pure research indicates the public spirit and broad-mindedness of that body. In the face of the charge that they seek to pollute public instruction by bribing professors to teach

untruths about the public utility business or to write what is not so regarding municipal or government ownership, the utilities turn the other cheek.

Favorable action on research was taken by the National Electric Light Association before the present investigation of public utilities was started or even suggested. The fund will be dispensed by the National Research Council of Washington, which body, we understand, will make allotment to the universities and colleges of the country interested in pure science research. Thus the electric light and power industry will have no control over the fund or the work to be done with it, but it will benefit with all other industry and with the country at large from the discoveries that result from the research thus made possible. These benefits are too great and too patent to any thoughtful man to leave room for cavilers to dispute the value of the association's large-visioned pledge.

* * * *

Electrical Wholesalers Take a Step Forward

AT LEAST the beginning of a more progressive policy is seen in the action that was taken last week at Hot Springs, Va., at the annual convention of the jobbers. They changed the name of their organization to the National Electrical Wholesalers' Association and they appointed a managing director. This realigns this organization in conformity with the other national associations of the electrical industry and also serves to emphasize the fact that the "jobber" is not a mere middleman but performs a function that is inescapable in the flow of the products of the factory. As Chairman Cullinan pointed out, the "jobber" does not merely buy and then resell. He warehouses and distributes. Some one must do this. The manufacturer may, if he will, assume this function in addition to that of production, or it may be put into the hands of the wholesaler, who is a specialist. But the services of wholesaling and distributing must be performed if the goods are to be made available to the local trade and to the consumer. Whoever performs this function, it costs money.

What are the economics of the case? The industry in general does not know and the burden of proof naturally rests upon the wholesaler. Here obviously is work for the N.E.W.A. to do that the manufacturer, the installer and the retail trade may know that distribution as organized in the electrical industry is orderly and efficient. And there are other problems, particularly concerning the wholesalers themselves, to which the reorganized association can well direct its attention. Employee insurance, employee stock ownership, cost of trucking—there are many such issues on which light is needed, as was pointed out by McKew Parr in discussing the opportunity for a broader service to the membership. The class relations of the wholesalers with the other organized branches of the industry also present many questions of pressing importance, such as excess warehousing by central stations and the tendency of many manufacturers to bypass their own jobbers on large orders. How can the wholesalers' service be made proof against this? It is apparent, too, that the jobbers now lack the close contact with the organized industry needed to keep the wholesaler in intimate and sympathetic touch with national trends. Here also the N.E.W.A. can help.

Undoubtedly there was at this meeting a much better spirit of harmony between the independent group of jobbers and the so-called "big three," meaning the houses affiliated with the Graybar, General Electric and Westinghouse companies. This, of course, is vital to the development of a constructive program. For what the wholesalers need most today are clear-cut industry purposes and well-defined policies based on the economic facts of distribution.

* * * *

System Economy More Important than High Unit Economies

A NEW thought is cropping out in the electric utility field which may seem old because utility companies thought they were achieving the result at which it aims by old methods. This thought, as expressed by H. P. Liversidge of the Philadelphia Electric Company, is that the industry is "not aiming to build generating stations with the highest individual economy but is seeking the best system economy."

As any company can judge for itself, erecting a new station with record economy does not improve the system generating economy much if there are a number of greatly inferior stations on the system. Likewise, erecting the most economical transmission lines in the country does not necessarily bring up the entire transmission and distribution economy greatly. Still, much construction in various parts of the country has been characterized by concentration on the economy of new units, stations and lines installed.

The recent trend has been toward more moderate capital expenditures for high economy in new components of a system and apportionment of the money which could be invested for super-economy in new units among old components for rehabilitation that will bring the best system results. By following this procedure and not forgetting that distribution losses quickly offset economies in generation, one company has brought its system economy to the unusual value of 19,000 B.t.u. per kilowatt-hour sold. The analysis of twenty-five large systems in the issue of the ELECTRICAL WORLD for January 8, 1927, would indicate that many companies have given more thought to the economy of new stations than to system economy.

* * * *

Electricity and the Human Body

IF ELECTRICITY can have performed so many remarkable services in lightening labor, if it can have raised the standard of living throughout the world, must we continue to say that it is impotent in repairing bodies and in keeping them in repair?

Not for long, certainly. Electrotherapeutics has passed the stage of charlatanism and magic and has settled down to sober and honest progress. The alluring but entirely fictitious powers of "electronic reactions" and all their breed have been exploded and electricity has at last taken an active hand. Chemistry, once the only reliance of medicine, has a new and powerful ally whose purpose, like that of its colleague, is sound investigation and reproducible results. Ultra-violet light from electrical sources, far more powerful than sunlight and yet more controllable, has already gained a substantial reputation in medicine. It is conceded to be a cure for rickets,

a powerful assistant in the treatment of tuberculosis and a bactericidal agent of great value in surface infections. It is also receiving much attention as an active force in the production of the still mysterious vitamins in foods. X-rays, thanks to the intensive developmental work done by science, are now under effectual control and with each new advance in the art of their production they are finding new applications in the war against disease and disability. At first their value lay principally in their great assistance in medical diagnosis, but they are now the basis of a complete new therapy, having well established uses in the treatment of certain kinds of cancer and kindred ailments.

These two—ultra-violet light and X-rays—are already firmly established. But there are other electrical phenomena that may soon serve the doctor in his fight for men's bodies. High-frequency currents, whose curative power has been in dispute for years, are now being suggested in medical circles as a possible means of aiding natural convalescence by producing artificial fevers. And recently has come the announcement of the cathode-ray tube, which can produce many hundred times more radiation than is given off by all the radium in the world and, unlike that rare metal, is under perfect control. Neither doctor nor scientist can say at present what the cathode ray may do for medicine, but it is quite possible that great benefits may come from it.

These are a few of the contributions and the promises which electricity, turning from the remodeling of industry, has made to man himself. Research in its unending perseverance, supported by an open public mind, may turn these promises to realities, and it may reasonably be hoped that pain and suffering will steadily decrease throughout the world.

* * * *

Follow Through in Plant Betterment

A HOMELY adage about putting one's hand to the plow and keeping on to the end of the furrow without turning back deserves consideration in power-plant betterment work in cases where a transfer of ownership results in new management. Few, if any, utility systems are ever finished, and almost invariably the acquisition of a property by a new group of investors finds improvements of greater or less importance under way in plant and field. The temptation to save money at every possible turn is often very strong upon a new management, and this often means a temporary slowing down of outlays for betterment which actually should be followed through in order to realize the best service and the lowest unit costs of operation in the long run.

It seems incredible that economically justified work should be curtailed, if not stopped entirely, by a new régime which is overanxious to make a better showing financially for the first year or so than did its predecessor; but such practice is by no means imaginary. To stop the installation of an automatic electrical control system, for instance, upon which perhaps $2,000 has already been expended and which might be completed for $500 more, may lengthen the period of risk associated with manual operation and perhaps do great harm in an emergency. Certainly one of the earliest engineering jobs to be done in taking over a plant should be a thorough check of all unfinished construction work, and if it appears that the previous management made a sound decision in starting it and carrying it forward, only the most convincing reasons should be allowed to interfere with its completion.

* * * *

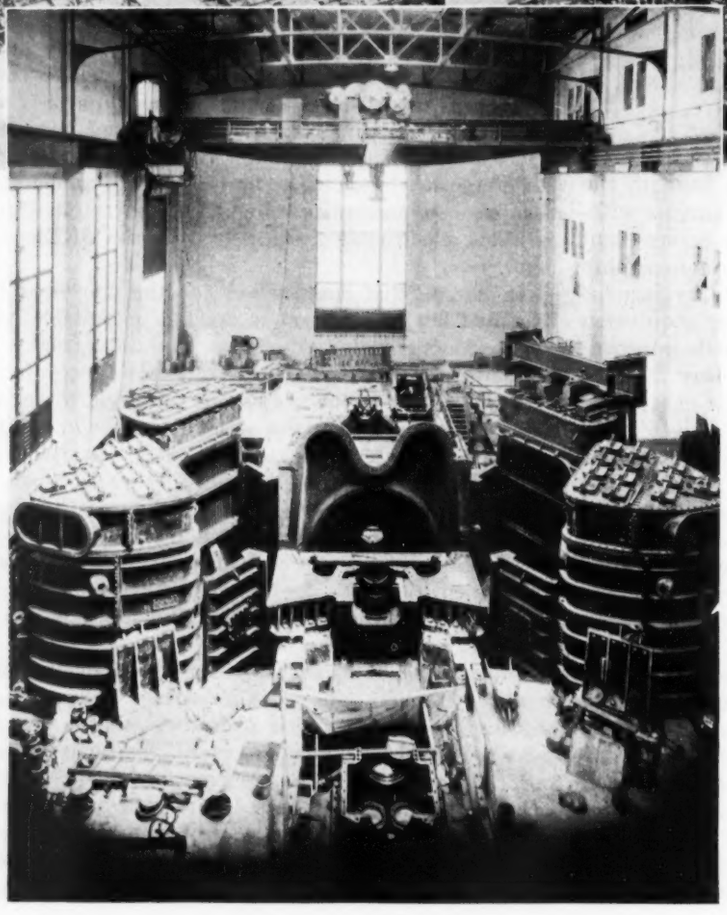
Heavy-Duty Appliances Beckon

FOR its sales objective the power industry has the electrification of the civilized world. As a potential load builder the modern home challenges the best efforts of the manufacturer, the dealer and the energy vender, defining load in broad terms. The ultimate consumer is interested in convenience, in saving himself or herself work, and in devices which contribute to the pride of life, to comfort and to service of high quality. James H. McGraw touched a responsive chord in his Atlantic City address when he referred to the luxury appeal of many nationally advertised commodities. The American viewpoint is focused on better living rather than upon parsimonious existence, and the development of the market for electric service in the homes of the United States should never fail to capitalize this distinction.

Heavy-duty household devices, typified by ranges, refrigerators and water heaters, are moving into the center of the commercial stage. Amazing success has been attained in selling many devices in a market of striking diversity as to buying power. Utility executives brought up as engineers are rapidly realizing the sales problems of the industry and turning their powers of analysis and constructive thinking to commercial expansion. Idle investment in plant and lines is being attacked and overcome by discriminating load building. Without neglecting devices ministering to convenience and enjoyment of life at the cost of low energy consumption, sales departments are concentrating upon the real load builders this year as never before. We shall see the results as the index of per capita energy consumption rises and as the pitifully small kilowatt-hour usage per residence customer so many companies still manifest grows toward adequate development. The heavy-duty appliance is the key to economic utilization of the investment required to serve electrically the far-flung homes of this favored land.

It is true that competition for the consumer's dollar is acute, but if the want is created by suitable advertising and other sales effort, our industry need not fear of getting its share of popular expenditures for better living. Business in volume is affected materially by prices, but ease of buying seems to be the key to growth of sales in the residential field, when coupled with the right appeal. It is significant that progressive power companies are widely establishing prices representing complete installation coverage and that they are getting away from the step-by-step method as fast as possible. "So much total" for an installed range or water heater, rather than "so much for the equipment" and "so much more for wiring and plumbing," if needed, is the line of least resistance. The deferred payment plan is a time-honored method and needs no defense. Rates are fast settling into a sphere of usefulness which enables the advent of heavy-duty devices at reasonable operating cost; the products of American electrical manufacturers of rank are unexcelled in beauty, durability and convenience, and the stage is set for profitable performance and satisfaction on the part of all who are prepared to play their parts according to sound business principles.

Long Beach Steam Plant Nears Completion



WORK on the Southern California Edison Company's Long Beach steam plant No. 3, which will have an ultimate capacity of 720,000 kw., is progressing rapidly and the first unit will go on the line shortly. The first of eight 90,000-kw. units is noteworthy because of its size and the terminal voltage of 16,500. The turbine is a single-shaft, tandem-compound unit which will utilize steam at 400 lb. gage and a temperature of 725 deg. F. The condenser circulating water discharges into a 22-ft. tunnel. The furnaces are constructed so that pulverized coal may be used in the future if desirable.

Surge Tests on

Isolated Neutral Network

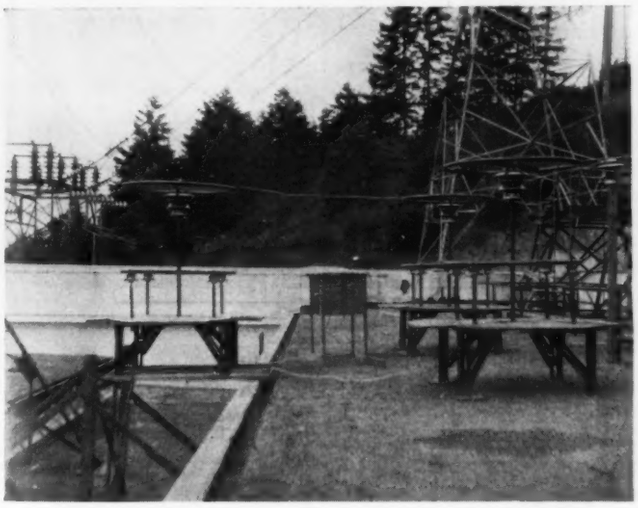
Klydonographs showed 26 per cent of surges on 55-kv. system to be above three times normal voltage

By R. RADER and V. B. WILFLEY*

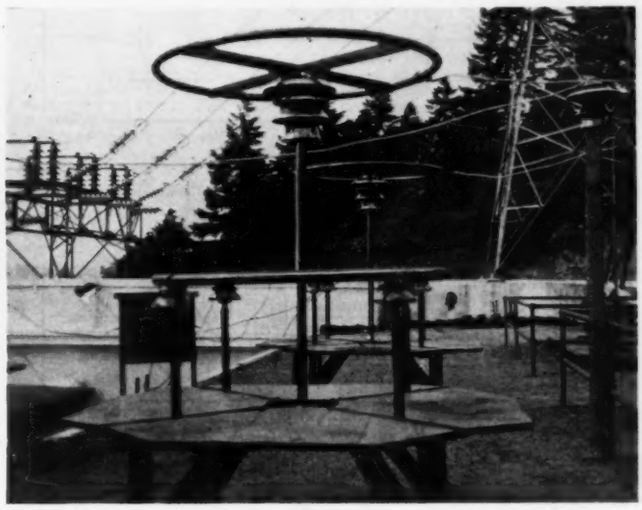
DURING the summer of 1927 tests were made on the 55-kv. isolated neutral system of the Puget Sound Power & Light Company to determine more accurately the causes of insulation breakdown, flashovers and kindred troubles resulting from switching operations, grounds, short circuits and other causes of transients. The 55-kv. system of the company consists of a network of 356 miles of line and is one of the few larger systems still operating with neutral isolated. As a consequence, the problem of minimizing troubles from faults occurring on the system is one of major importance.

Three klydonographs placed at salient points on the system were used in making the tests. The klydonograph as an instrument for recording high-voltage surges has been described a number of times since its development by J. F. Peters in 1924 and will be discussed only briefly here. The mechanism is contained in a compact case which includes a photographic film revolved slowly by clockwork to produce a continuous record. One 8-ft. film will last a week, or, if operated non-automatically, the time and spacing of the pictures can be governed at will. The proper normal voltage of 2,500 to 3,000 volts, crest value, across the instrument is obtained by means of potentiometers between line wires and ground. Fig. 1 shows a simple diagram of the electrical circuit.

The potentiometers were constructed by the Puget Sound Power & Light Company, the plan of a single unit being shown in Fig. 2. Three such units are necessary for each three-phase klydonograph. It may be noted that the two rings consist of 1½-in. iron pipe bent into circular form with ends welded. The upper ring was mounted on a 73-kv. insulator and the lower ring on four 13-kv. insulators. The four sections of the ground plate when clamped together formed an octagonal shaped plate which was mounted on wooden supports and connected solidly to ground. The four rods supporting the 13-kv. insulators and the lower ring were clamped between sections of the ground plate, making it possible to regulate the elevation of the lower ring. Each unit was adjusted separately, since the sphere gap calibration took care of any variation. The rings were approximately 4 ft. 6 in. in diameter, which is recommended for voltages of the class under test, although reasonable variations are permissible where space is a limiting factor. A small wooden housing with glass window was used for protecting the klydonograph from the weather. The potentiometers were placed in the form of an equilateral



Complete three-phase potentiometer installation



Assembled potentiometer for klydonograph test

*Office engineer Puget Sound Power & Light Company and engineering division, Westinghouse Electric & Manufacturing Company, respectively, Seattle, Wash.

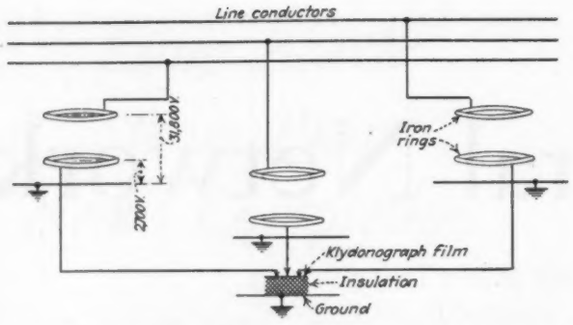
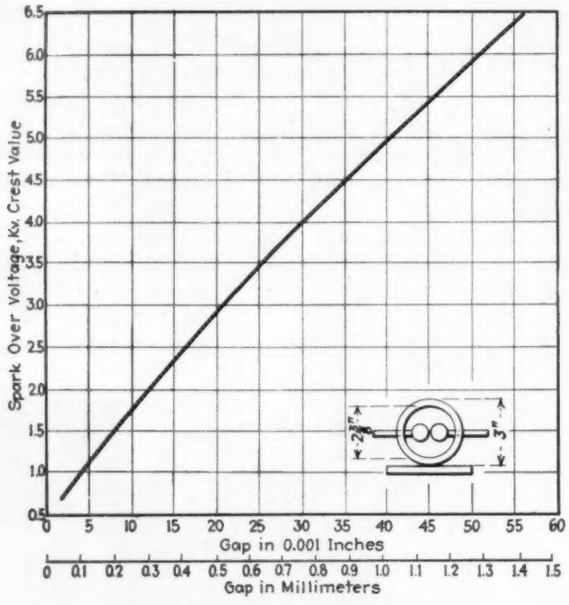


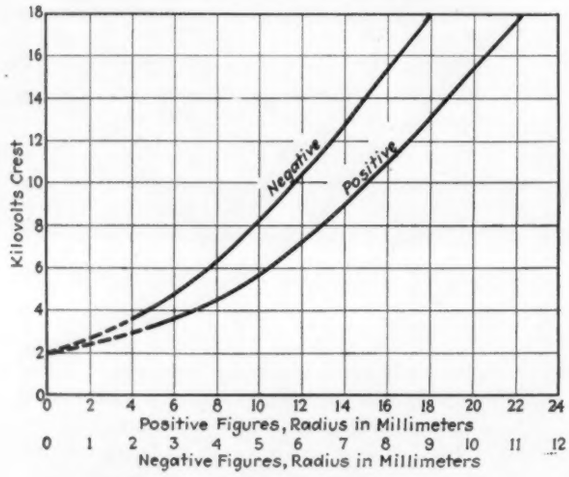
Fig. 1—Schematic diagram of klydonograph connections

triangle, as shown in one of the accompanying illustrations, with approximately 9 ft. between adjacent live parts. In the center of this triangle was placed the klydonograph in its wooden housing.

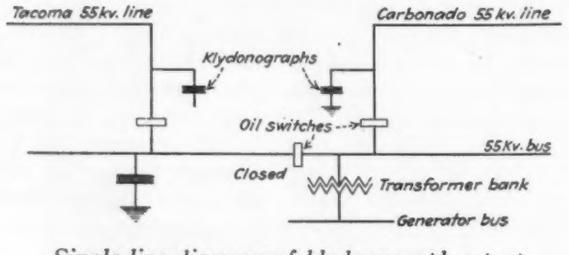
The recording operation of the klydonograph is comparatively simple. A surge of any magnitude on the transmission line will appear in the same magnitude on the upper ring and for any fixed position the potential on the lower ring will always be proportional to the potential on the upper ring, hence the line. The klydonograph, being connected between the lower ring and ground, receives a certain proportion of this potential, the ratio or multiplying factor being determined for each set-up by



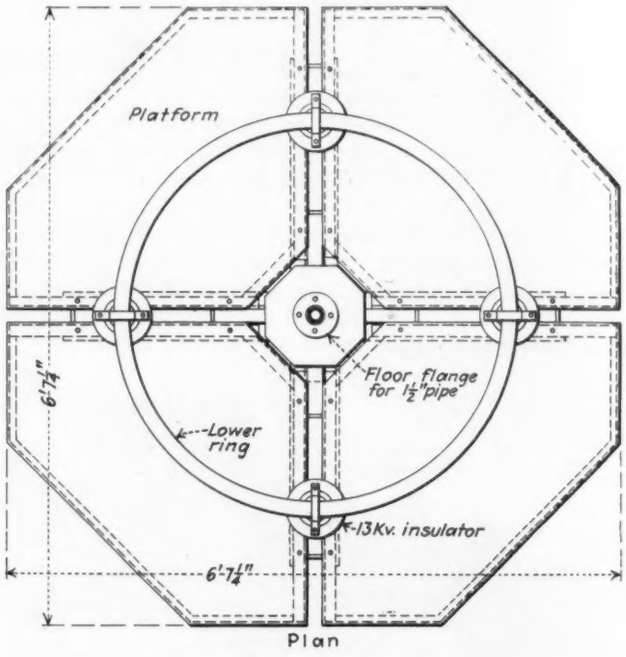
Sphere gap calibration curve



Klydonograph calibration curves



Single-line diagram of klydonograph set-up for measuring switching surges



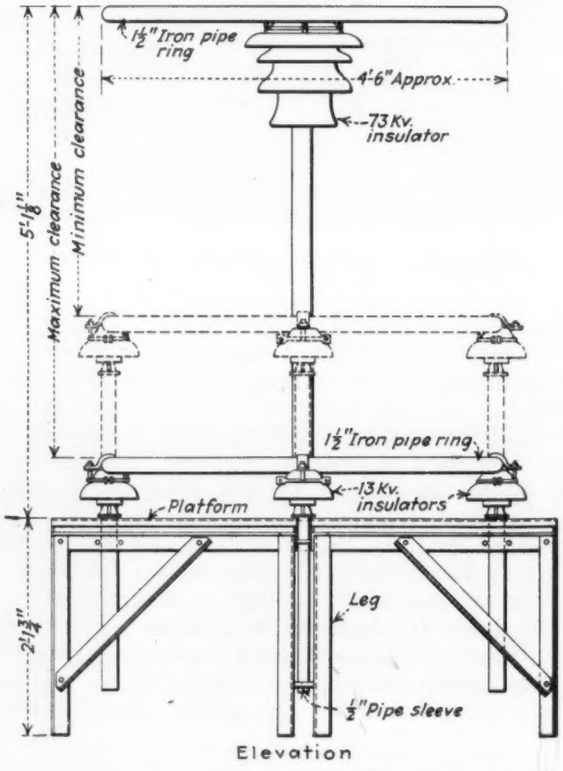
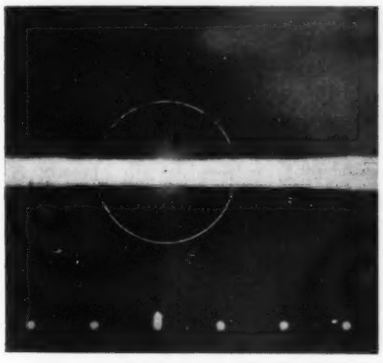


Fig. 2—Plan and elevation of potentiometer unit

calibration. Normal line voltage was obtained by means of the station potential transformers and instruments. Voltage between the lower ring and ground was obtained under normal voltage conditions with ⅝-in. spheres adjusted so an arc would just break over. The voltage corresponding to this separation was read from the sphere gap calibration curve illustrated.

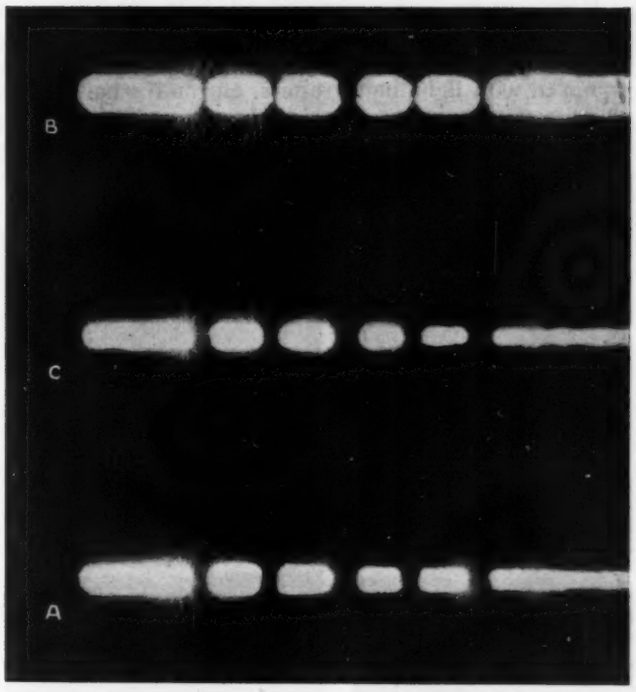
Knowing the ratio of line voltage to that on the lower ring, it was next necessary to determine the actual voltage on the lower ring produced by a surge as recorded on the instrument. This involves a knowledge of the relationship of the picture appearing on the film and the voltage producing it. The calibration curves illustrated showing this relationship had been made previously by the manufacturer as a result of extensive experimental work. In these curves crest voltage on the lower ring is plotted against the radius of the figure on the film.

As an example of the calibration of one of the potentiometer units, it was found that after the height of the lower ring had been adjusted the sphere gap arced over at 0.020 in. separation as measured with a thickness gage, corresponding to a crest voltage of 2,930 on the sphere gap calibration curve. The line voltage read 55,000 volts between wires or a line to neutral potential of 32,100 r.m.s. volts. Assuming a sine wave, the crest value was therefore 45,400 volts, which, divided by 2,930, gave 15.4 as the calibration factor for this potentiometer. For this calibration the upper ring was about 5 ft. above the ground plate and the lower ring about 2 ft. above the ground plate. The two other units were calibrated in like manner.



Surge record marked for measurement

Klydonograph studies were begun at White River, the largest and most central generating station on the system with a capacity of 60,000 kw., three three-phase instruments being located there for several weeks. The location of the instruments and related lines and bus sections is shown in an accompanying diagram. Later the instruments were moved to the Massachusetts sub-



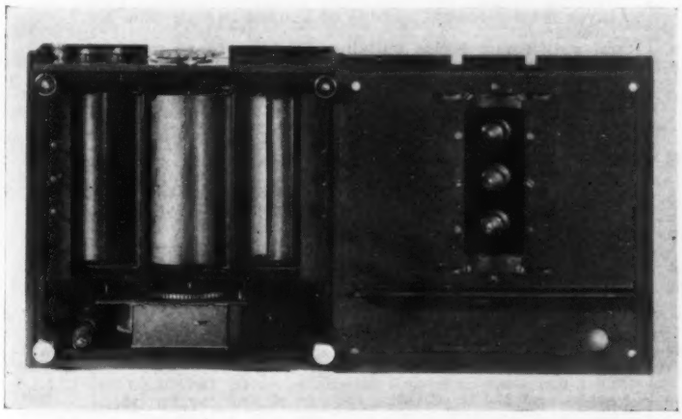
Section of developed klydonograph film

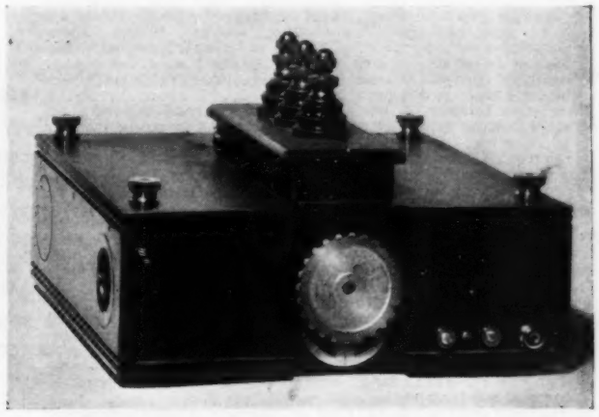
The discontinuous line indicated is the daylight line produced by admitting light through a small hole in the instrument case. It serves as a check on time, also recorded by the dots shown. Beginning at the left of the film the lines representing the phases are caused by the normal voltage and are continuous until a circuit breaker operation removes the potential from the instrument. Widths of the lines vary due to differences in calibration of the instruments on the three phases. It is characteristic of the instrument for slight changes in voltage in the lower part of the operating range to produce considerable change in width of the normal voltage line.

station in Seattle and to the Beverly Park substation, some 30 miles north of Seattle. Three instruments were found desirable on this extensive system to expedite tests and allow analysis of surges from simultaneous records taken at different points.

Oil circuit breaker switching tests, totaling 144 operations at various points on the system, disclosed that practically every operation produced surges on one or more phases, ranging in voltage value from normal to 3.9 times normal. A classification of surge values follows:

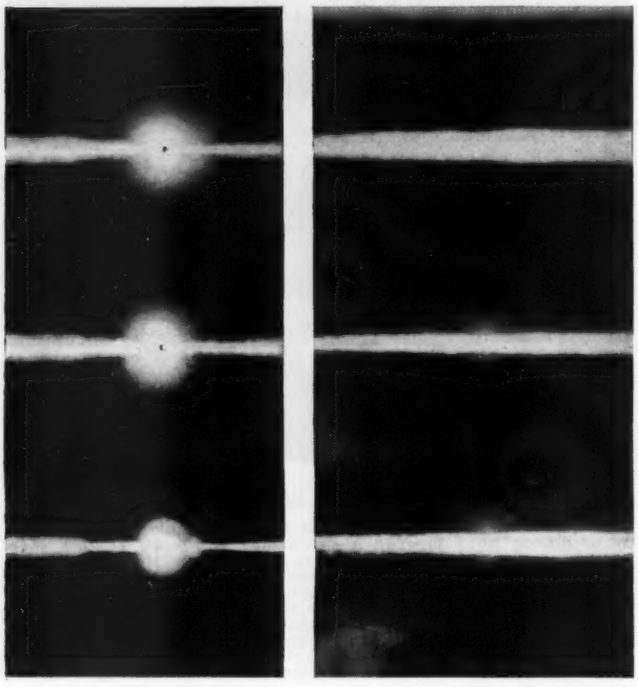
Magnitude of Surge	Per Cent Total Number of Operations
Three to four times normal	8.3
Two to three times normal	26.6
One to two times normal	65.1





Standard three-element klydonograph

High surges were obtained on both opening and closing of circuit breakers, those obtained on opening being somewhat more frequent. Lines under test were equipped with lightning arresters, but no discharges due to surges were observed. However, few of the surges were above the operating voltage of the lightning arresters and in general the higher the voltage of a switching surge, the briefer its duration, so that probably the higher surges recorded had a total duration of less than enough to warrant the operation of the type of arrester on the system.



Figs. 3 and 4—Typical examples of klydonograph pictures produced by short circuits, arcing grounds and transformer bushing failures

The size of the images in Fig. 3 is due to repeated surges from arcing and from switching operations. The surge on one phase reached 4.9 times normal voltage, or 220,000 volts to ground.

After completing the switching tests the instruments were installed at three salient points on the system and left in continuous operation to record the effects of faults which might develop. Twenty-two records were thus obtained, including trouble from short circuits, arcing grounds and transformer bushing failures. Figs. 3 and 4 represent typical examples. The intensity of Fig. 3 is due to repeated surges from arcing and from switching operations. The maximum surge occurred on the upper phase and reached 4.9 times normal, or 220,000 volts to ground.

Surges from line troubles proved to be greater than those caused by switching, 26 per cent being above three times normal. Operating experience shows that arcing grounds give the most trouble, and although each surge is of short duration, continued arcing very frequently causes insulation breakdown at several points on the system before the line can be cleared.

The tests proved conclusively the existence of high-voltage surges on the system during times of line trouble and during switching, either with or without the interruption of load current. The measurements were sufficiently accurate for practical use and have given the operating engineers a clearer vision of what actually occurs under the conditions described. The information has proved useful in planning ways and means of preventing equipment failures and service interruptions. Results are in line with other limited experiments on the magnitude of surges to be expected on ungrounded systems and accentuate the advisability of using star-connected transformers with grounded neutral for high-voltage transmission. This seems especially true in connection with the rapid strides being made in the development of protective equipment, whereby all classes of system trouble may be quickly isolated and localized.

Cost of Fuel-Handling Equipment

EXCLUDING overheads, the following data give the installed costs of miscellaneous fuel-handling equipment estimated on a 1927 basis by the engineers of a New England light and power company. To all items 5 per cent may be added for contractor's compensation, but no allowance for engineering, interest during construction, taxes during construction, etc., is included.

Miscellaneous Fuel-Handling Equipment Net Cost Data (1927)

(Installed, Without Overheads)

Coal unloading tower structure, hopper and service equipment, 22 ft. x 25 ft. x 167 ft. high, with four reinforced concrete piers on 40-in. thick reinforced concrete mat on hard pine grillage supported on wooden piles; superstructure structural steel tower with outrigger arm for bucket hoist trolley; receiving hopper, ½ in. thick plate; lighting equipment and heating equipment (65 sq.ft. exhaust steam radiation) included	$62,607
Raw coal bunker in boiler house, reinforced concrete on steel beams and girders, hopper-shaped bottom, bunker 40 ft. wide, 224 ft. 6 in. long, 24 ft. deep, maximum capacity 20 tons per linear foot	67,635
Three fuel oil riveted steel storage tanks, each 95 ft. diameter, 30 ft. high, with extended bottoms 105 ft. diameter, 12 ft. 6 in. high for fire wells; foundations 8-in. thick cinder concrete mat with 1-in. plastic cement top; tanks equipped with wrought-iron ladders, fire protection plank float over entire oil surface, steam line supply and lightning protection of galvanized wire network on poles over tanks with ground connection	136,862
Fuel oil service tank, foundation and fire protection, riveted steel, 42 ft. diameter, 20 ft. high with extended bottom 52 ft. diameter and 5 ft. high, foundations similar to above	8,794
Fuel oil sludge tank and house, riveted steel 7 ft. diameter, 34 ft. 6 in. long, supported on concrete cradles, corrugated-iron sides and roof	1,309
Pulverized coal bunkers, four in number, 80 tons capacity each, structural steel frame supported on building steel, shell of bunkers ⅛ in. thick steel plate with exterior covered with 1½ in. thick layer of asbestocel with ½-in. layer plastic cement; inside of bunker has air pipe for circulation	$47,109
Coal pulverizing house building, 40 ft. x 85 ft. x 22 ft. high, with upper portion 40 ft. x 69 ft. 3 in. x 60 in. high; foundations reinforced concrete mat without piles, superstructure steel, brick and reinforced concrete, tar and gravel roof, 1925 cost	167,676
Lighting installation of above with 100-watt lamps, etc., including conduit, vapor-proof fittings, etc., 1925 cost	1,498
Heating installation for above	3,430
Plumbing for above	842
Unloading tower, Hunt 1½-ton bucket, King 15-in.x15-in. hoisting engine, 160 lb. pressure, two cylinders; also 10-in.x12-in. two-cylinder hoisting engine, with hoisting ropes, track, etc.	13,176
One single roll 24-in.x40-in. crusher, Pennsylvania armor type, driven by 50-hp., 550-volt, three-phase Westinghouse motor	4,201
Two 300-ton per hour, 36-in. belt conveyors, 30 ft. center to center, 15-hp. motor	12,334
One 134-bucket conveyor, 15-hp. motor, buckets 24 in. x 18 in. x 11 in.	14,414
One weightometer for 36-in. belt conveyor	2,905
One 2-ton coal railway, automatic, with two platform scales and 230 ft. of 19-in. gage track and car (wooden)	2,613
Two fuel oil rotary pumps, 753 gal. per minute each, 50 lb. working pressure and motor drive	10,030

The Trouble with Buying

The basic causes of price cutting. Where the seller and the buyer are responsible. Three things to do about it and two recommendations for a course of action

By Earl Whitehorne
Commercial Editor Electrical World

EXECUTIVES of American industry realize today that they have made a serious mistake through the last quarter century. They have allowed themselves to become so absorbed in the problems, the achievements and the fascinations of production that they have neglected distribution. Our methods of distributing our goods have grown by main strength and awkwardness. And so the American business man faces this well-known problem. It is constantly discussed, and if all the paper that has been used up in writing about distribution were placed in one pile it would probably interfere with the orderly progress of some star. Also, something else has been happening that has not been generally noticed. This tremendous increase in production has brought with it an intense pressure on sales. The growing output of the factory—everybody's output—has been driving the salesman to desperate ingenuity. And American industry has also become so engrossed in selling that it has neglected the efficiencies of purchasing. The world has honored and courted the salesman, while the purchasing agent has gone his way unseen and unsung. And yet for every sale there must be a purchase and the practices and the policies and the principles of the man who buys have as much influence upon the success of the transaction as the methods and the motives of the man who sells.

This article, which concludes a series of discussions by Mr. Whitehorne on the very pertinent problem of price cutting, was presented before the recent annual convention of the National Association of Purchasing Agents in Kansas City.

His first article, entitled "Who Pays the Cost of Price Cutting?" was published on Feb. 18 and was followed March 17 and May 19 by an analysis of experiences and opinions of both buyers and sellers. And these, in turn, have called other writers to expression.

The subject is of universal interest because every business organization must both buy and sell and pay a price. Certain recommendations are made in this article and the editors will welcome frank opinion.

The time has come, therefore, to turn some thought upon this business of buying that has so much to do with whether sales are profitable or not. We have got to throw the searchlight on the present status of the purchasing function in industry just as we have got to study and reform the process of distribution in this country.

By Guess and By God

For we have reduced our manufacturing to a science. We think in terms of B.t.u.'s per ton of coal. We invest thousands of dollars in machines that will make possible the continuous saving of a fraction of a cent. We select and organize our labor and support each operation with four-and-a-half horsepower. We govern the very motion of a man's hand. Yet we do our purchasing too often "by guess and by God," we sell at whatever price will get the order and we deliver the goods by an overgrown mechanism of distribution so cumbersome that it often costs more to get the shipment into the hands of the customers than it costs to manufacture it. In other words, while we pour science and efficiency into our production we proceed with the selling and the buying of these commodities that we have so zealously and skillfully produced by a system so hit or miss that as soon as we get into a buyers' market the sellers start cutting prices and the purchasers begin to profiteer, and there is a general warfare between the very men who must depend upon each other for the conduct and prosperity of business. And economic warfare is no less destructive of dollars than the battling of armies. And so today we have many branches of industry very much exercised over the prevalence of price cutting, with nobody knowing just what to do.

Well, what should be done? One thing is certain, there is no general cure-all for price cutting—no panacea that will save the world. The only sensible approach that I can see is to examine into the causes and see if any common sense corrections can be found. Obviously, there are two causes—what the seller does and what the buyer does.

Well, what do they do that causes price cutting and demoralizes markets? Let's take the seller first.

The seller in a buyers' market becomes afflicted with overproduction. This brings on an acute attack of "volume-itis" and pressure is put on his salesmen to get orders. At the buyer's doorstep his salesmen meet other salesmen who are suffering from the same anxiety. Some of them are armed with the weapon of cut price. To get orders, to get volume for the factory, they have been told to sacrifice the profit. They do. And when one does, many do. And this induces a kind of hysteria, a state of mind that is just a form of fear. It is price cowardice. It is a kind of mob psychology that will

sweep right through the salesmen of any branch of any industry.

There is only one thing that cures this kind of demoralization. If the salesman's boss possesses the intestinal fortitude to control him and to lead him out of his fear it can be stopped. Otherwise it runs its course till it ceases from exhaustion.

Price Courage

It is a simple thing—price courage. When a manufacturing company enters the market with a line its officials set a schedule of prices based on their costs, which in turn are regulated by competitive conditions. If the president of that company will permit his sales manager to come in and talk him into permitting a price cut to get some big order and the salesmen find it out, then the salesmen will everlastingly be importuning the sales manager to let them cut to meet another bidder on this job and that. But when the sales manager knows that the president has price courage, that gives him the guts to stand up against the salesman. And when this salesman knows that the sales manager also has price courage he will battle with the buyer and refuse to telephone the office and ask for a better price. To put it flatly, the salesman who believes in his boss carries price courage wherever he calls. Price cutting is not the salesman's fault. It is the fault of the executive who cannot face the fact that the only relief in a market demoralized by overproduction and price cutting is reduced production. It is the fault of the executive who lacks the pluck to reduce his output rather than sell at a loss. Industrial America at present is volume mad. But manufacturers ultimately will have to face the economic law that to sell at a loss is waste and an offense against industry. And when prices fall below cost they will have to accept their individual responsibility voluntarily to curtail production as their contribution toward restoring the market to a balance.

This sounds very idealistic. I realize that. But price cutting today is due more to the folly of the seller than to the cupidity of the buyer, and the seller will have to provide his share of the reform. And, of course, he can, for he always has the power to refuse to sell. He can control the price at which he himself sells, if he is willing when necessary to sacrifice volume for profit.

The Buyer's Weakness

Now let's take a look at the buyer.

The purchasing agent has always been the redheaded stepchild of industry. In the beginning the boss did the buying in odd times. Then he detailed a young man to help him. As buying has grown in volume purchasing agents have become more important, until today in many progressive corporations the buying is done by a vice-president with an able staff, and he is a big man with a broad knowledge of markets and men. But in too many cases the purchasing agent still lacks the responsibility and authority he needs to make his job measure up to his titular function. Too often he is just expected to buy what he is told and his performance is measured by his ability to save money on price.

He is more or less in the unenviable position that the policeman occupied say twenty years ago. The policeman's job as he saw it then was to walk his beat and swing his club and hope that he could catch some son-of-a doing something. And the whole world hated the cop. And then came the automobile and traffic, and we took the cop and set him on the crosswalk to help the people and to keep the cars moving. Now the world is for him. He is our friend. Just so there are too many purchasing agents today working with a mental attitude that is protective, detective and combative. They are working with the defensive idea of getting what they must buy for the lowest price instead of the constructive, productive idea of developing the greatest possible value for the dollar spent. Financially it may be the same. But phsychologically and economically it is very different. One is positive and the other is negative. One stimulates and the other depresses. One promotes co-operation and good service and the other doesn't. In the last few months I have discussed this business of buying with a good many men—purchasing agents and sales executives both. I have discovered one very interesting thing. Man after man has told me with pride and enthusiasm of the ideal relations which they have established with some buyer or some seller.

With this customer or this vender they have understanding and reciprocity. They know each other. The seller appreciates just what this buyer needs in quality and in service. He knows the organization and how it works. He and the purchasing agent pull together like a team of good gray horses. They keep each other advised as to the trends of the market. When the factory is running slack they anticipate requirements a bit. They discuss costs and profits at times and protect each other. The buyer knows that in an emergency that seller's factory will turn itself inside out to serve him.

What to Do

1. If the purchaser would demand firm bids, then general price cutting would soon cease. For a firm bid is like a signed order. It's the word of the house. It puts industry on the one-price basis just as solidly as the modern department store. It means that a price made is the best and final price and the buyer is expected to place the business by selecting the firm bid that offers the best value—not price alone but value.

2. While this practice of firm bids is crystallizing into a custom, whenever bidders are called back by a purchasing agent and asked for a better price, let the bidder demand that the other bids be shown to him, so that he will know that he is not being lied to, and that his price is indeed high for equal value.

3. And while the trickery of baiting bidders still continues in the world of business let bidders hold post-mortem comparisons of bids, by submitting their bids on closed business to their trade associations for comparison and report.

4. And let the buyer frankly and publicly proclaim that he will thereafter shun the man who cuts his price, because the first price is supposed to represent the honest value of the goods, and the man who cuts stands self-convicted either of trickery or weakness.

There is no price cutting between this pair. They are dealing in values.

I know one purchasing agent who tries each year to call at least once upon the presidents of the principal companies from which he buys. He wants to get acquainted, to see the factories and judge whether or not they are efficient, to size up the organizations, the plants and the principles that stand behind the goods.

Sales Executive Calls on Buyers

I know of one very large industrial buyer—one of the greatest in the country—who not so long ago sent a vice-president, no less, traveling the country calling on the presidents and sales managers of the manufacturing companies from which he buys, just to inquire whether they were entirely satisfied with the treatment they were receiving from his people. I daresay he carried smelling salts to administer to those who were overcome by the shock. And when this vice-president returned home and had recovered from the entertainment he said that he believed this trip to have been one of the best investments his company had made, reckoned in terms of good will and insurance of the material and service being supplied.

There are many enlightened buyers who are doing this kind of thing. They do it because it helps them in their business. It costs money in the long run to scatter business in small purchases, now from one and now from another. It costs money to haggle with salesmen. It costs money to bicker over bids. It costs money to break in new venders, to establish specifications and assume quality.

As one large buyer stated it to me, "There are four factors in every purchase that should be given consideration in the order named:

"1. Suitability to the need.
"2. Quality of the article.
"3. Responsibility of the vender.
"4. Price.

"Price is only one of the elements that must be weighed in establishing a value, and it should not be considered until the three other factors have been established as satisfactory." That is a pretty broad statement, but I believe it is a true one. This man knows what he is talking about.

Therefore, if the purchasing agent is to contribute his share toward overcoming this practice of price cutting that industry is suffering from and stewing about right now he must face these facts, and, facing them, he will bring new dignity to his profession and new opportunity to himself. He must recognize that nothing short of this ideal relationship between the seller and the buyer is really efficient and profitable. He must set his entire operation as nearly as possible on that plane and make value, not price, the chief objective. He must study the cost of buying as well as the cost of goods.

For who knows today which costs the most—to shop among fifty venders or to establish a close co-operative relationship with twelve? How much more does it cost to interview fifty salesmen than to give the same time to representatives of six selected suppliers who qualify completely in all the other factors of value?

Oh, I know the arguments! There are good ones a-plenty on both sides. But the point I make is that we have too little accurate knowledge of what it costs to buy, too little recognition of the relative importance of value as compared with the mere price factor, too little measuring of price against the other factors. And, in a word, industry will have to learn more about the economics of buying and organize its purchasing on a more constructive basis for the production of better values in trade before we put an end to the ruthless waste of price cutting.

How do we start? That is the pertinent question. There is a simple way, I believe. There are four things to be done. I have mentioned them on other occasions, but they need much repeating. I have listed them, therefore, in the box on page 1286.

Price cutting is just an economic disease. It can be cured. It can be cured by public opinion within industry. And immediate relief can only be sought through the building of public opinion among buyers and sellers. But the only way there is to develop public opinion is by discussion that corrects loose thinking and makes clear the moral and economic principles which all men desire to follow once they are generally understood.

This calls for leadership, and I believe that in this kind of a situation this leadership can best come from two sources—the industrial associations and the industrial press. I, therefore, offer these two suggestions, which I believe will bring more immediate influence to the correction of the practice of price cutting than any other action which might now be attempted:

1. That the trade, industrial and business publications of the country promote the widest possible discussion of the economic inequity of price cutting, drawing out the opinions, principles and practices of the leading men of the field and developing a more common acceptance of the truth of it and a more general adoption of these simple resources of correction.

2. That the trade and industrial associations of each branch of industry support this purpose by calling a conference of the leading purchasing agents of the group to meet with a representative number of their prominent sales executives, for a discussion of the ethics and economics of this business of buying to the end that trade practice in that field may be improved both in selling and in purchasing in so far as price cutting is concerned.

I have asked a good many sales executives this question, when they have been discussing this buyer market:

Suggestions for Immediate Results

1. That the trade, industrial and business publications of the country promote the widest possible discussion of the economic inequity of price cutting, drawing out the opinions, principles and practices of the leading men of the field and developing a more common acceptance of the truth of it and a more general adoption of these simple resources of correction.

2. That the trade and industrial associations of each branch of industry support this purpose by calling a conference of the leading purchasing agents of the group to meet with a representative number of their prominent sales executives, for a discussion of the ethics and economics of this business of buying to the end that trade practice in that field may be improved both in selling and in purchasing in so far as price cutting is concerned.

"What is your own purchasing agent doing? Is he buying in the way that you would like to have your own customers buy? Does he foster price cutting?"

To many of them it has been a new slant on the subject. And yet there is no single influence more important to success in sales than the methods and principles of the man who buys. It is worth while, therefore, for the sales-minded chief executives of industry to see that their own purchasing methods are right.

The industrial press can help promote such a check-up. And a systematic discussion of the business of buying by such groups of purchasing agents, with executives present, would have a far-reaching effect in automatically applying common sense and curing this malady.

Three-Power Locomotive for Switching Service

By S. T. Dodd
Railway Engineering Department, General Electric Company

A THREE-POWER electric locomotive has recently been placed in service by the New York Central Railroad. It is, primarily, an electric switching locomotive operating from either a 600-volt trolley or third-rail supply. In addition to this, when used in yards or sidings where no electrification has been installed, storage batteries enable operation for considerable periods.

In order to charge the battery an oil engine-driven generator set, having sufficient capacity to operate the locomotive at slow speeds without the battery, is provided. In normal service the load factor of a switching locomotive is about 10 to 30 per cent and this design provides that the engine generator set will furnish the average power required, while the battery will furnish the intermittent surges or fluctuations. Using the engine and battery together, the locomotive is able to operate continuously in "off-trolley" service.

Overloading of the generator by the engine is avoided by providing the former with a drooping characteristic. At light loads the maximum voltage of the generator will balance the voltage of the battery at the finishing rate on full charge. The motor equipment consists of four geared motors rated at 415 hp. apiece. The locomotive will develop tractive efforts as high as 60,000 lb. The control power is the same for either trolley or battery operation.

The current for the secondary operating circuits, such as control, lights, etc., is taken from the storage battery. The interesting feature of the control system is the transfer between battery and trolley as a source of power. A main transfer relay is provided to change from battery to trolley or third-rail power. If the "battery run" button is open the locomotive will operate as a straight electric locomotive and no transfer from trolley to battery will take place. If this button is closed and the locomotive passes a gap in the third rail, or for any other reason is deprived of external power, the motor connections are automatically changed from trolley to battery.

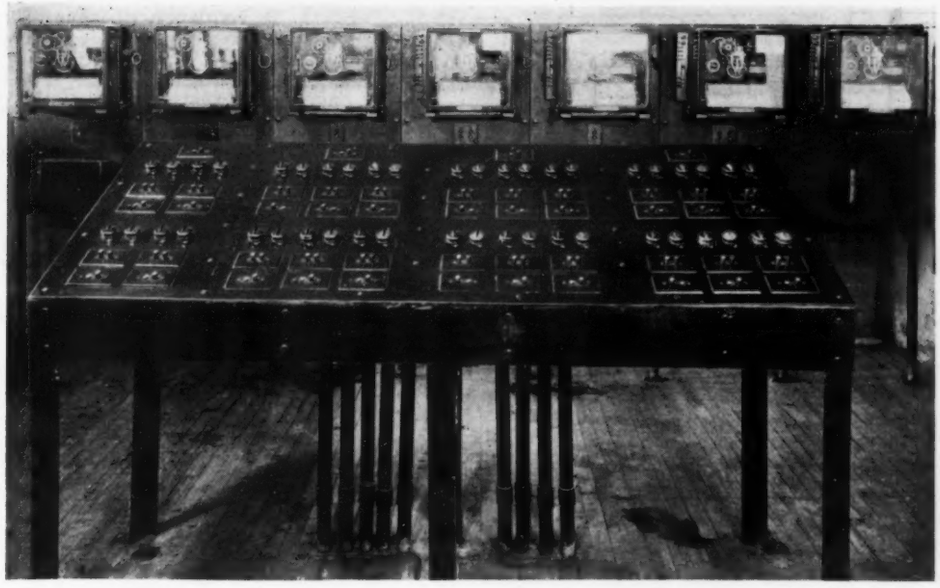
While operating this way on the battery, if the locomotive again makes connection with the trolley operation will continue on the battery until the controller is thrown to the "off" position.

Analysis of Twenty Utility Companies or Groups in New York, Pennsylvania, New Jersey, Maryland and Delaware Handling Over 100,000,000 Kw.-Hr. in 1927

Showing percentage of generating capacity in hydro, margin of generating capacity above system peak, extent to which energy is purchased, per cent utilization of generating equipment, system losses (including transmission, conversion and distribution), per cent of output to different markets, kilowatt-hour per domestic customer and generating capacity. Based on reports received from companies and presented in the May 5 issue of the Electrical World.

	Buffalo, Niagara & Eastern	N. Y. Edison-United & Allied Cos.	Mohawk-Hudson	Brooklyn Edison	Northern N. Y. Utilities	Rochester Gas & Electric	Central Hudson Gas & Electric	Philadelphia Electric	West Penn Electric	Duquesne Light	Pa. Power & Light	Pa.-N. J. Power	Pa. Water & Power	Assoc. Gas & Elec. (Pa.)	Penn Cent. Lt. & Pwr.	East Penn Electric	Public Service Elec. & Gas	Atlantic City Electric	Consol. Gas Elec. Lt. & Pwr.	Delaware Elec. Pwr.
Per cent of generating capacity in hydro	75	0	52	0	94	39	58	0	11	0	16	9	83	30	5	0	0	0	negl.	0
Ratio 30-minute kilowatt peak to generator kva. (per cent)	79	63	[2]69	55	87	49	[2]103	60	[2]52	71	[7]66	[2]54	[2]83	55	47	[7]71	68	[7]71	[2]60	[2]80
Per cent utilization of maximum theoretical capacity	46	27	19	23	40	22	28	29	30	37	22	26	50	29	26	38	29	29	17	36
Per cent of purchased power to total energy	22	negl.	50	negl.	6	17	41	21	1	6	33	30	0	11	1.3	12	8	19	48	11
Per cent losses (transmission, conversion, distribution)	8.3	[1]18.3	15½	15.2	8.7	16½	14	10.6	[4]12.5	8.2	8.8	12.6	[4]9.8	17	13	11.3	15.8	....	9.8	10
Sales (kw.-hr.) per cent of total output																				
Railways and other utilities	17	9	21	21	36	14	42	[3]29	11	17	12	38	90	5	18	41	14	....	16	14
Residences	3	.....	6	21	} 3	11	5	8	5	11	5	4	0	7	8	3	} 24	....	10	9
Commercial	6	.....	6	18		} 49	6	12	5	[5]7	5	5	0	6	5	3		....	11	8
Power	64	.....	43	36	52		27	37	65	[6]48	66	37	0	64	49	41	42	....	50	45
Kw.-hr. per domestic customer	716	.....	327	320	....	437	291	390	428	600	330	286	0	335	450	267	....	....	487	360
Total gen. capacity (1,000 kva.)	[8]730	[8]972	373	482	111	[8]119	52	[8]597	[8]515	384	[8]247	243	145	159	97	[8]41	[8]624	[8]40	[8]222	31
Thousand domestic customers	212	.....	234	632	....	88	33	390	189	240	143	96	0	84	40	21	....	56	164	23

[1] Due partly to suburban losses. [2] Based on 60-minute peak. [3] Includes railroad supplies. [4] Includes intracompany use.
[5] Retail light and power. [6] Wholesale power. [7] Based on instantaneous peak. [8] Expressed in kilowatts.



Pyrometers and control bench of Packard enameling ovens

Electric Enameling Used

in Packard Plant

Ovens for continuous process effect large savings over batch method. Use of filtered air in counterflow to work assures quality of product and economy of heat

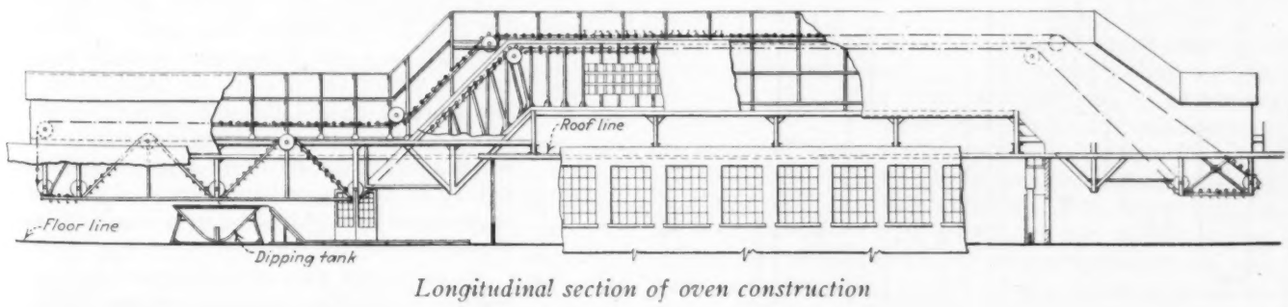
By R. J. GAUDY

Executive Engineer Sessions Engineering Company, Chicago, Ill.

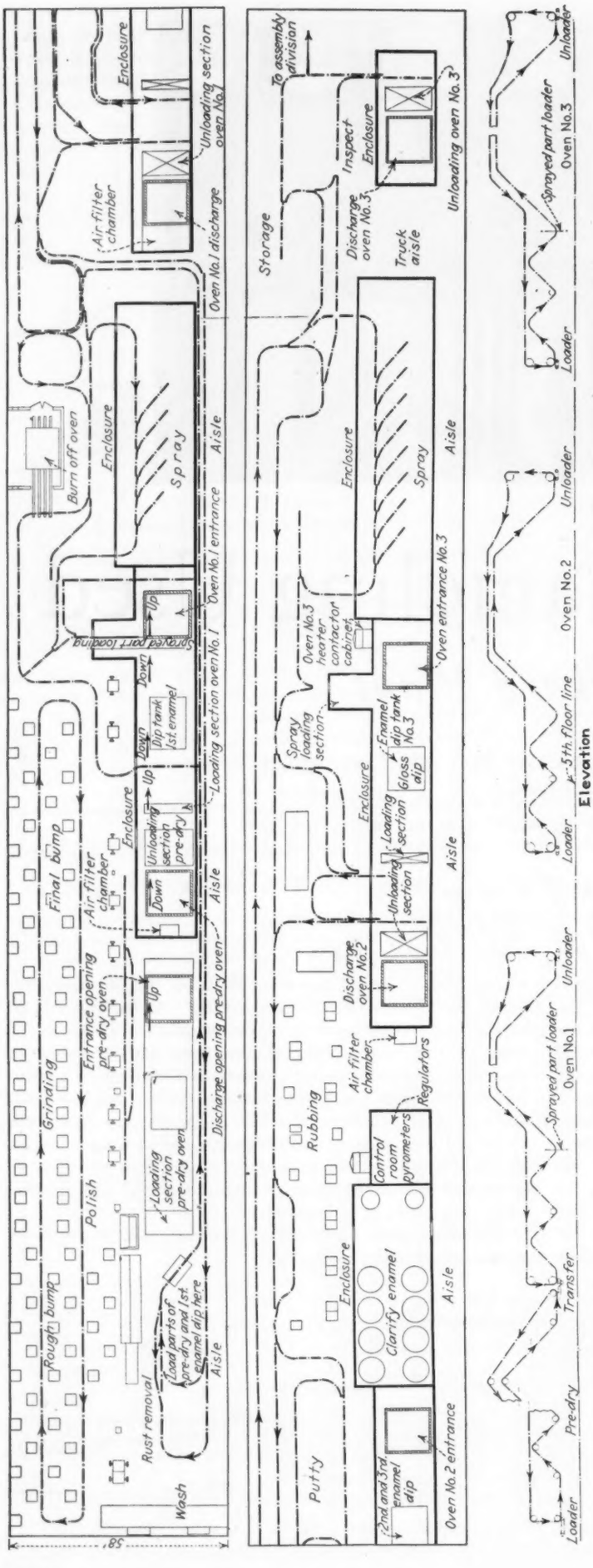
AN ADDED quality of enthusiasm may now be noted when you "ask the man who owns one" about the enamel job on the fenders and other parts of his Packard car. This is not to say that Packard enameled parts were ever less than the best job that could be done, but simply to state that Packard takes full advantage of advances in the enameling art as it does in all others. The latest forward step is the use of continuous process electric ovens which were designed and installed by the Sessions Engineering Company under the direction of R. R. Rees, manager of the construction division of the Packard company.

At its principal factory in Detroit the company has for a long time done all the enameling on the parts, so finished, in electrically heated ovens. A battery of 26 batch type ovens served for many years. These ovens were of the best pattern of the type, each oven being loaded by hand and carried automatically through a carefully determined time-temperature cycle. Such a production plant wherein batches of work are prepared, processed and released intermittently called for excessive, selective handling and spasmodic progress, which is conspicuously absent in all other manufacturing and assembling procedure in this plant.

The continuous operating enameling plant has distinct advantages which result from:



Longitudinal section of oven construction



General layout of enameling department shown by plan of work floor and profile of conveyor travel in ovens

1. A sequence of several continuous conveyor ovens, allowing the multiple coat work to be processed without interruption or storage, thus greatly reducing the chance of faulty product.

2. The manufacturing of parts ahead of finishing in a continuous stream of delivery. This continuity means that with conveyor ovens the flow is uninterrupted on through to the finish, and thence to the continuous assembly lines.

3. The inspection of work in progress being rigorously followed from the time the work enters the department, and the uniform flow of similar pieces to the inspectors permitting a well-timed inspection, which results in better selective criticism than possible with batch-by-batch inspection.

4. The power input and the attained temperatures and time of passing through the baking cycle being fixed over the length of each oven and all pieces by their uniformly rapid travel through the oven being, for each coat, subjected to exactly the same flow, baking and recooling cycle.

5. The dipping of work for each of several coats being done in single tanks of stock, continuously conditioned and perfectly controlled as to temperatures.

The greatest virtue of the continuous process in enameling is obvious. It is that, after their determination, the conditions which result in a perfect product may be maintained with great precision throughout the whole production flow. These conditions of heat, air properties, etc., must be re-established during each operation in the batch process and consequently they are more liable to error and change than if, once arrived at, they are maintained. It is much easier to hold oven conditions constant than it is to duplicate in following cycles the perfection of the first.

The oven layout, as evidenced from the drawing, shows the relative location of four ovens; these units are in the order of pre-dry oven, two-body coating ovens, Nos. 1 and 2, and finish coat ovens. The work after preparation, polishing and chemical cleaning is cleaned by torrent washing and immersion rinse, after which it dries rapidly and thoroughly in the pre-dry oven and is dipped immediately in the first coat of finish. The bond between metal and coat for which the Packard enameled parts are notable is assured by this unbroken series of preliminary steps. Thereafter, the parts are removed from the line of progress and inspected and prepared for each of a number of body coats. The two ovens, Nos. 1 and 2, are more densely loaded than is either the pre-dry or finish oven, as the work is passed through either No. 1 or No. 2 as many times as there are coats ahead of the gloss coat. After the body of the finish is built up as required and is rubbed this body is given the final gloss coat by a single passage through oven No. 3.

If the parts pass the final test for perfection a pendent conveyor system delivers

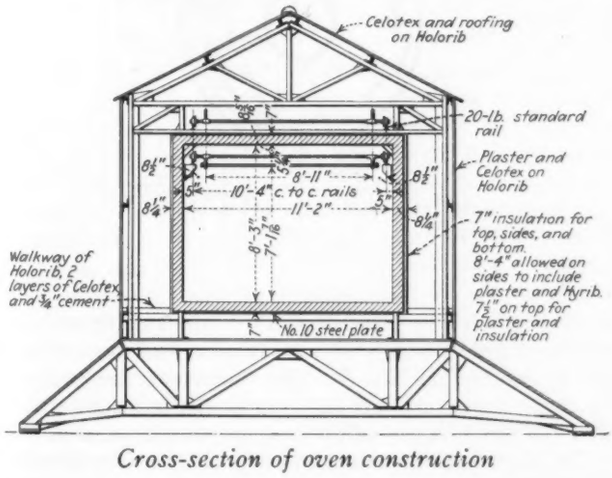
the work as needed to the assembly lines. In addition to the constant speed conveyors through each oven, the complete mechanical handling system throughout the department is arranged so that the work is handled to and from each operator with the entire elimination of storing, trucking or rehandling. The work passing through the department comprises a wide variety of pieces that undergo an equally wide variety of treatments as to preparation and number of coatings. Certain pieces and assemblies are sprayed and introduced onto the oven conveyors between the dip tank and oven entrance.

As shown in the accompanying illustrations the work is handled to and from the ovens in sealed inclosures in which the supply of filtered (dust-free) air is applied under such pressures and in such quantities as to maintain the counterflow of air within the ovens. This counterflow opposes the flow of work and preheats the make-up air, unavoidably lost to the volatile removal, by cooling the discharging work. The thermal economy of such counterflow is pronounced.

The ovens are of the extended A type, rising over the roof of the building in which the department occupies the upper floor. The space below the oven runs is fully effective working area. The ovens consist of an internal structure fully dust-tight and carrying the conveyor runway. Around this interior is a continuous envelope of insulation.

The electric heaters are mounted on the floor and walls within the oven. The most perfect control and maintenance of temperatures is possible by the multiple circuit arrangement of heaters. The perfection of location and control and the predominance of radiant heat delivery, and, further, the lack of need for excessive movement of the gases within the oven far offset, for quality production, any possible differential inferred by the lower unit cost per heat unit of other classes of heat source.

As this oven cycle is designed to maintain a fixed curve of temperatures throughout the oven length, all circuits which are required to supply the constant losses are placed on manual switching and are held constantly on

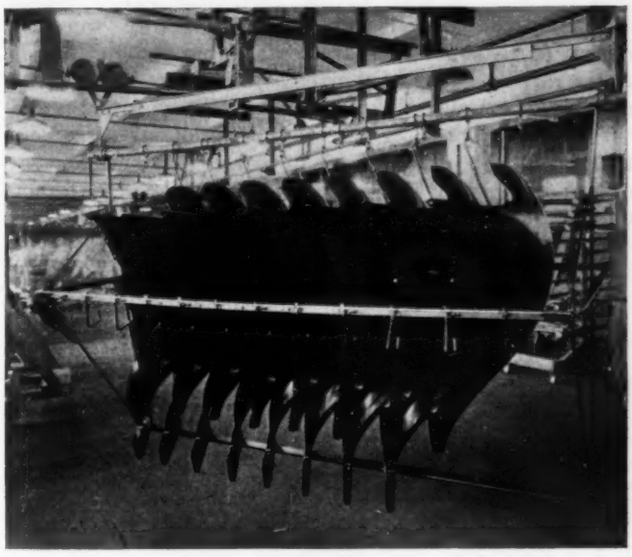

Celotex and roofing on Holorib
20-lb. standard rail
Plaster and Celotex on Holorib
8'-11"
10'-4" c. to c. rails
11'-2"
7" insulation for top, sides, and bottom. 8'-4" allowed on sides to include plaster and Hyrib. 7½" on top for plaster and insulation
Walkway of Holorib, 2 layers of Celotex and ⅜" cement
No. 10 steel plate

Cross-section of oven construction

the line. The very small increment or decrement of input required by the heat carried out by the work is controlled by the oven temperature. Perfect performance as to load factor is limited only by the adjustment of the small variable input so that its "off" time may be minimized.

There are two controlling recorders with elements located near both ends of each coating oven. The automatic control of the small amount of intermittent input may be assumed by either recorder. Both instruments are continuously recording, but only one is normally in control. If, due to variation in the heat drift caused by changing interception of counterflow, it is required to transfer the control to the opposite end, this is accomplished by a simple three-way flush switch.

The heaters are operated at the power service voltage



Work rack with fenders in process

for machine tool motors (460 volts, three phase, 60 cycle) from the company's standard power substations, which are supplied with primary energy by the Detroit Edison Company. The heater installation, as a non-inductive load with a power factor of unity, improves the over-all plant power factor. For example, if one-third of a load block were heater load, then the other two-thirds could operate at a power factor below 60 per cent, with a resultant for the total of 80 per cent.

The improvement in electrical load factor of the enameling department is apparent from a comparison of the demand of the batch type ovens with the demand of the continuous oven that replaced them. The old ovens had a concurrent demand of more than 4,000 kw. A far greater amount of work is being done every day with the continuous oven, which has a connected load of less than 1,000 kw. The total energy consumed per set of parts for one finished car for all coats is less than 140 kw.-hr., as compared with more than 270 kw.-hr. with the batch type ovens. The conveyors, pumps, fans, polishers and all power tools are individually motor driven and operate at very high load and power factors.

The prime requisite of the Packard management for high quality of product has been thoroughly met by the performance of this finishing plant. The new equipment, with its wide variety of operations and the exact requirements in the control of the many variable conditions, is able to deliver product (1) in greater quantity; (2) at less cost; (3) with perfect uniformity; (4) of highest quality, and (5) with full freedom from troubles due to the recurring cycles in non-continuous plant.

The installation would have been fully justified by the improvement in the quality attained alone, but in addition the saving in power cost, handling labor, wasted enamel, rejects after baking and other direct benefits are of such value as to represent, at present production, a gross annual return of half of the total outlay.

Multi-Speed Pump Control Maintains Water Level

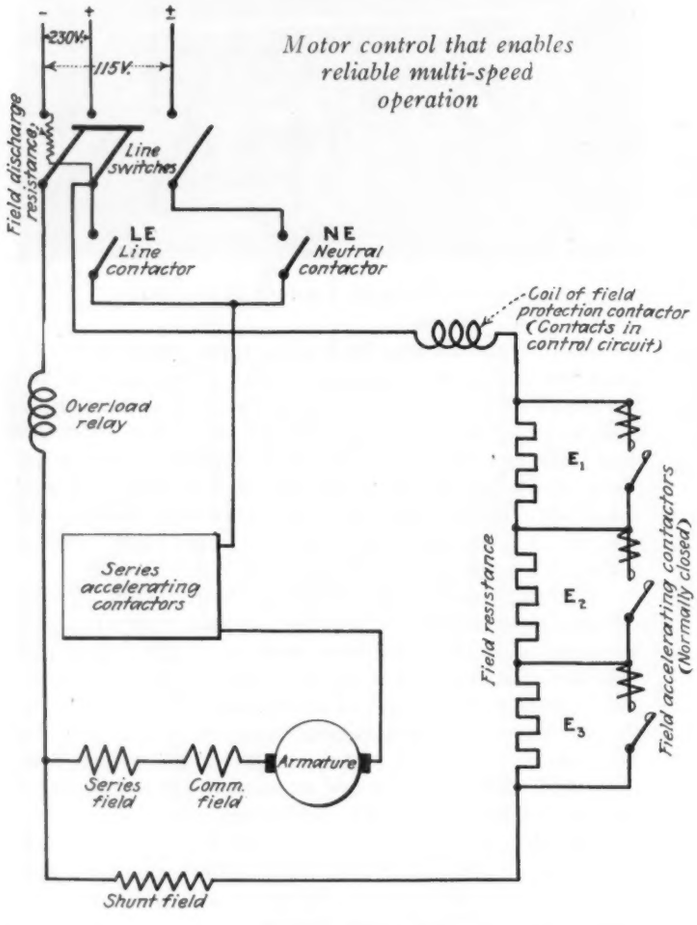
By L. Stone
General Electric Company, Schenectady, N. Y.

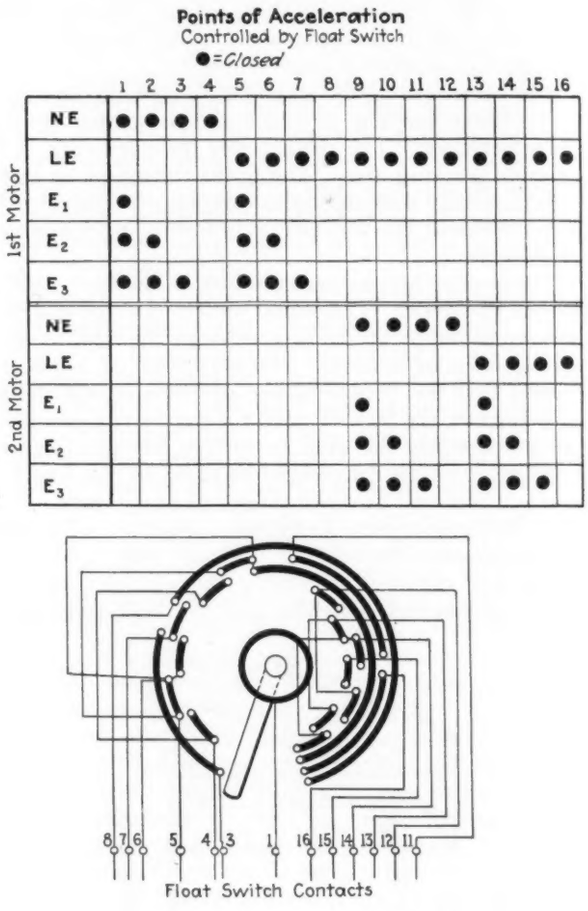
PUMPS ARE used in the Waterside No. 1 station of the New York Edison Company to force water, in excess of the boiler requirements, from the surge tank to the mixing boxes of the feed-water heaters in Waterside No. 2. A special panel and control was found necessary adequately to regulate the operation of three centrifugal pumps functioning in parallel and which are driven by three 30-hp., 230-volt, variable-speed direct-current motors.

As originally installed, a special float switch was mounted over the discharge well and connected to a large float in a 12-in. pipe. This float switch had a number of contact points connected through throwover switches on the panel so arranged as to start one motor automatically when the level of the water rose to a predetermined point, and, as the water rose, to speed this motor up in three steps, and finally to cut in the second motor and speed this up in the same way as the level of the water in the well rose. It was found, however, that the characteristics of the pumps and the head against which the water was forced varied somewhat from the original analysis, and that the motors were continually accelerating and decelerating between points in order to hold the water level at the proper point and prevent loss through overflow. It seemed desirable to get a larger number of speed points, and the space available would not allow much increase in equipment.

It was therefore decided to connect the armature of the motor first across 115 volts; that is, between one leg of the 230-volt Edison service and ground, accelerating with the three field resistance points, then to throw over to 230 volts and, again, by field acceleration, get the other increases in speed. This would give, instead of four points, eight points of speed regulation for each motor, or sixteen points in all. The additional equipment necessary was one neutral contactor, one auxiliary relay and a few changes in the interlocking and holding coils of the series accelerating contactors used in starting the motor. The float switch contacts were changed in the customer's shop, giving a final layout as shown in the accompanying figure.

The sequence of operations follows: The operator decides which pump he desires to run and throws the selector knife switches over to connect one motor in as No. 1, another as No. 2. The throw-over switches on the third motor are left open, although it is possible to close the third motor switch and use this in parallel with one of the others in case of an especially heavy demand. As the float rises, it closes the neutral line contactor and the motor accelerates by means of the series contactors to the low speed. Voltage and current coils of the series accelerating relays are all in circuit. If the water continues to rise the float switch moves on to segments 4, 5 and 6, which operate the three accelerating contactors, each cutting in a section of field resistance. When segment No. 7 is reached the contactor coil is energized on one side, but does not pick up until the



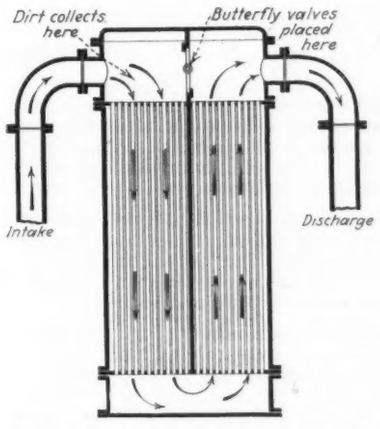


moving arm runs off of segment No. 6. At this time the accelerating contactor is open, allowing the auxiliary contactor to close. The arm has, at the same time, run off of the segment holding the neutral contactor closed, which allows the line contactor to close and throw full voltage on the armature with all field resistance short-circuited. As the water continues to rise faster than the pump can pump it out the three accelerating contactors operate, which brings the pump up to maximum speed. The second pump starts and its speed increases in the same manner.

If the flow of water into the well decreases, the float lowers and cuts down the speed of the motor. The auxiliary contactor prevents reduction to low speed until the water level has fallen sufficiently to assure that there will be no hunting due to a small motion of the moving arm.

Flushing Condenser Tube Sheets

THE Northeast station of the Kansas City Power & Light Company takes its condensing water from the Missouri River. This stream is not noted for its pellucid depths, but very much the reverse. At times it is necessary to keep a man continually at work removing débris from the trash bars and the revolving screens really revolve; they don't stand in one position for a day or so at a time, as is the case in more favorably located plants. In spite of trash racks and screens, however, there is an appreciable amount of more or less finely divided rubbish that must pass through the circulating water system.



Tube sheet flushing arrangement

The condensers in the station are of the vertical double-pass design and it not infrequently happens that this rubbish will accumulate in such quantity on the surface of the tube sheet of the first pass as seriously to impede the flow of water through the condenser. The newer condensers in the station are arranged so that the water circulation in them may be reversed, and in this way the refuse collected on the tube sheet may be washed off. It was not possible, however, to reverse the flow in the older condensers and some means of cleaning the sheet, other than shutting the unit down and removing the dirt by hand, was highly desirable, and the means was found.

The accompanying illustration shows the general design of the condensers in question. Two butterfly valves, each one extending about half the length of the separating wall between the intake and discharge chambers, were installed. The only reason for two valves is that they are easier to handle than a single one. The valves are operated by levers attached to the valve shafts which are brought outside of the condenser shell. The first idea was that the valves could be thrown to the open (horizontal) position, indicated by the dotted line in the sketch, while the unit was in operation and that the water would rush across from the intake to the discharge side and wash the dirt off the tube sheet in its mad career. This result was not achieved, however, because the time required to open the valves permitted a gradual equalization of pressure between the intake and discharge sides and the water flowed smoothly across without the excited turbulence expected.

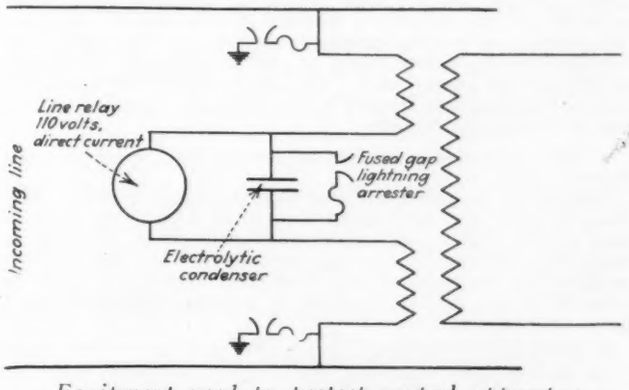
It looked as though the idea was impractical. Then it was suggested that the operating procedure be modified, the intake be reduced considerably, the valves then opened and the intake flow be released with a rush. It worked. The water dashed across the tube sheet and scoured the dirt off the tube sheet in a very gratifying manner. The whole operation takes only a minute or so. As a measure of precaution the load on the turbine unit is cut down while the flushing is going on, but it can be done, if necessary, with the turbine at full load. The only effect is a momentary loss of a few inches of vacuum, which are immediately regained when the butterfly valves are swung into the vertical position.

Protection of Control Circuits

By John H. Nelzen
Wisconsin Public Service Corporation, Crivitz, Wis.

CONTROL circuits that are carried on pole leads with power lines are subject to occasional overvoltages caused by lightning, by crosses with the power lines and by induction from power line faults. These disturbances are dangerous to the control equipment and to operators. After a great deal of experience with different types of lightning arresters, none of which afforded perfectly satisfactory protection on 36 miles of control line, the Wisconsin Public Service Company tried out and found to be quite successful the scheme detailed here.

The control circuits are so devised that all operations are performed through the functioning of a single master relay connected across the control pair. The problem was to arrange some means by which this relay might be protected from extraordinary line conditions. A telephone insulating transformer of one to one ratio with the line winding parted and brought out in the center



Equipment used to protect control apparatus connected with power lines

was installed. The relay was then placed between the two halves of the primary winding, which was connected across the control line. A condenser with a capacity of 6 mfd. was shunted across the relay terminals, as was also a gap-type lightning arrester. The secondary of the transformer is connected to the telephone and supervisory apparatus that also makes use of the control line.

24 Points on Range Selling

Analysis of potential market and sales methods made by C. J. Eaton, commercial manager Middle West Utilities Company, for the N.E.L.A. domestic electric range committee

AN EXCELLENT cross-section of electric range selling methods used by central-station companies in different sections of the country has been compiled by C. J. Eaton, commercial manager of the Middle West Utilities Company, in a report for the domestic electric range committee of the N.E.L.A. Commercial Section. With a view to studying these sales methods Mr. Eaton asked 24 pertinent questions bearing particularly on employees' use of electric ranges, campaign methods, quotas and advertising practices. From the replies received he was able to select those from 24 companies, which gave sufficiently complete data to tabulate and analyze. A study of the summarized replies to each question reveals a number of significant facts about development of the electric range market and raises some further questions to which both the central-station companies and electric range manufacturers should give thoughtful consideration.

The potential market for electric ranges as viewed by the various companies ranged between 50 per cent and 100 per cent of the customers in non-gas areas. On this basis, with 17,596,400 domestic customers connected to the lines of the power companies and approximately 10,500,000 artificial and natural gas ranges in use in the country, there remain 7,096,400 residential electric customers who should be using electric ranges. Only 590,000 electric ranges are in use, leaving a potential market of 6,500,000 in territories not served by gas. The question naturally arises in the minds of electrical men, why should not the other 10,500,000 domestic

Twenty-four Range-Selling Points

1. Basis of Making Quotas.
It seems that most of the companies base their quotas upon the number of residential meters connected, taking into consideration the sales of past years, and general business conditions. One company points out that it does not deduct from the number of residences the number of ranges in use, for it finds that where there are a few ranges in use sales are more easily made.

2. The Potential Market for Electric Ranges.
The potential market is stated as being anywhere between 50 and 100 per cent of the lighting customers of non-gas areas. Some of the companies qualified their estimates by saying that a reasonable rate and a reasonable purchase price would be necessary.

3. Methods of enlisting the support of the company employees in promoting electric range sales.
Six of the 24 companies do not seem to encourage employee support in any way. Eighteen companies give bonuses for leads. Eight allow their employees to purchase ranges at reduced prices, usually at cost, and the same number of companies hold special meetings for the purpose of instructing employees in the desirable features of electric ranges, method of operation, etc. One company, besides selling ranges at cost to employees, gives them a half rate on energy used. The great majority of companies believe that employee support is very desirable, if not necessary, especially during campaigns.

4. Basis of paying employees for turning leads in which result in range sales.
Eighteen of the companies give bonuses ranging from $1 to $5. Some of them have time limits of 30 or 60 days. One company pays an extra bonus if a definite appointment for the salesman is made, and finds that this is most satisfactory. Another company requires that the employee talk personally with the prospect in order to be sure that the employee is actually boosting the company's sales and service.

5. Merchandising relations with local dealers.
Of the companies reporting, twelve have satisfactory relations with local dealers and twelve do not solicit dealer co-operation. The form of co-operation in most cases was allowing the dealers to tie in with the company during campaigns. Some of the companies carry the customer's account when sold by a dealer and allow the dealer a commission on sales. Several of the companies turn over the work of installation to the local dealers, which is very satisfactory to both parties.

6. Plans for securing the support of domestic science schools.
Fourteen companies have no special plans for securing the support of schools. Six companies give reduced prices, two of which also give special lectures and demonstrations. Four of the companies give special lectures to classes, but offer no inducement in the matter of price.

7. Plans for working with the county home agents.
Only five companies have any relations with county home agents and only one sells ranges to the agents at reduced prices. The other companies help in giving demonstrations and cooking schools in the county home agent's home.

8. How the women's committee of the N.E.L.A. can be utilized.
Few of the companies state how this committee can be utilized. There are some companies, however, that use the suggestions of the women's committee through their own women's organizations, giving lectures before women's clubs and societies.

9. Developing electric range business outside of the gas district.
With the exception of two companies, all of them leave gas areas very much alone, either because gas is used outside the company's territory or because of the fact that the company is also interested in the gas business and does not wish to compete with itself. In the case of the two companies, it was stated that they competed favorably with cheap gas and that they thought gas was a very small factor in retarding electric range sales.

10. Basis of establishing the selling prices.
Eleven of the companies sell at list prices suggested by the manufacturers. Twelve companies have their own method of establishing prices; three of them base it upon actual cost plus a mark up of 50 per cent. Two companies sell at list plus installation cost. One company establishes the price on basis of average overhead plus special advertising cost plus the salesman's commission and cost of installation. This gives a price equivalent to an 85 per cent mark-up on invoice cost. Six of the companies are careful to quote prices to their customers in lump sums, including the charge for installation.

11. Methods of training the retail salesmen.
The general method of training new salesmen is by means of the experienced salesmen and the manufacturers' representatives. Many of the companies hold frequent sales meetings for the proper instruction of salesmen, and manufacturers' representatives are usually asked to address these gatherings.

12. Advantages of newspaper cooking schools and how they can be promoted.
In regard to newspaper cooking schools, it seems that twelve of the companies have not tried the idea. One company has found the plan unsatisfactory, three have had only moderate success and eight companies believe them to be very valuable in stimulating sales. Most of the companies using the schools agree that they should be promoted by the manufacturer, keeping the utility company more or less in the background.

Twenty-four Range-Selling Points (Continued)

13. What advertising mediums can be effectively used, and the limitations of each media?

The opinions of the companies in the matter of effectiveness of advertising mediums differ very much. Seven companies put their faith in direct-by-mail advertising and state that newspaper advertising is of the least use to them. Fourteen companies report that the newspaper suits their purposes best and two state that direct-by-mail is unproductive compared to its cost. One company uses recipe books to very good advantage in campaigns. Some of the companies operating in rural districts are of the opinion that displays at fairs and carnivals help their sales materially. Three companies had tried billboard advertising without expected results, one report stating that the effect of billboards could not be judged in any way.

14. How can range business be developed in small towns, many of them without stores or daily newspapers?

Eight of the companies believe that small towns can be developed only by solicitation. Some think that a demonstration in some rented place should be given before an attempt is made before solicitation. Two companies find that cooking schools run under the auspices of some local club, or sponsored by a grange or church society, are very effective in developing small towns. One company has a model kitchen built upon a truck body which it uses in giving demonstrations in smaller towns and they find that they get a great deal of publicity and noticeable results.

15. Methods of compensation for retail range specialists.

Three of the companies using range specialists pay them a straight salary, four pay on the basis of commission only and eight pay both salary and commission. Those companies using the latter system of payment find that they can get better men with that method and that there is a smaller turnover for salesmen.

16. Time payments and down payments, and limits of each.

Only one company of those reporting sells for cash and does not use the time payment plan. The down payment required by the others ranged from $1 to 25 per cent of the retail price. The time limit was from one to two years. The most general plan was 10 per cent down and a year to pay. Many of the companies emphasized the fact that the down payment should be large enough to insure the company of the customer's interest in keeping up with his proposed payments. Most companies charge from 5 to 12 per cent extra for purchase on the time payment plan.

17. Advisability of utilizing general salesmen or employing specialty salesmen.

Nine of the companies use general salesmen only, five use specialty salesmen exclusively and four use both. It seems that where the utility company is operating in cities specialty salesmen are used, and in a territory of small towns general salesmen are used. Companies operating in both cities of some size and smaller towns too use specialty salesmen in the cities and general salesmen in the territory covering small towns.

18. Value of campaigns and form which they should take.

Not many of the companies gave opinions as to how campaigns should be conducted, although all but one thought campaigns were valuable. This one company stated that the usual campaign stimulates sales, but a slump follows the campaign that destroys all effect of the stimulation. The commercial manager of this company uses contests between districts every three months that last for a period of two months each, and finds that system much more satisfactory. Another company, although it believes campaigns valuable in stimulating sales effort, does not offer special inducements to purchasers. It found that the prospective customer would always hold off buying until the campaign period. Many of the companies give premiums during the campaign period, or allow a smaller than usual down payment. None of the companies cut prices during campaigns.

19. The seasonal characteristics of the range business and whether ranges can be sold throughout the entire year.

The season characteristics of selling ranges seem to depend on the climate of the territory in which the utility operates. While all companies stated that ranges could be sold throughout the year, in most cases the spring and fall seasons seem to be the best for sales. In territories where the climate is moderate through the year the Christmas season seems to be the best.

20. The farm market and how it can be developed.

In the case of eleven companies the farm market has not been developed and they have no plans for the future development of that territory. It is the opinion of five companies that house-to-house solicitation is the only method of development. Four companies hold demonstrations at farm center meetings and gatherings of grange societies. Three companies carry on extensive work with state experimental farms and obtain much publicity and very good results from this activity. One company endeavors to interest rural districts by getting ranges used for church suppers. The company representative is present to see that the range is used properly and to answer questions. He allows the women of the church do all the cooking. A power company whose customers in rural districts nearly all use electric pumps sells the farmers transformers so that the customer can use power for household use at the power rate. This promotes range sales especially, the company finds.

21. The effective forms of appeal to be used in advertising in the order of their relative importance.

The most effective appeal used in advertising seems to be "convenience." Cleanliness, economy and dependability of operation are almost as important. Pride of ownership, modernity and safety are of only average importance. In the South the most effective appeal is the lack of heat radiating from the stove, which enables the housewife to cook in comfort during the hot part of the day.

22. Store demonstrations—their value and how conducted.

Eleven companies find store demonstrations valuable and three find them of no use. Four companies use store demonstrations once in a while, but their experience shows that a demonstration in a hall or theater is of much more value because of the fact that people are more apt to be open-minded and are more easily approached away from their store. Those companies that think the store demonstration valuable agree on the fact that it is best if food is actually cooked and served to those attending the demonstration. They also agree that the demonstration should be conducted by some one who is very well experienced in the operation of electric ranges.

23. The value of demonstration in the home after the sale has been made.

All of the companies agree to the value of a demonstration after the installation, some stating that it is the most important part of the sale. It is reported by some that it not only insures satisfaction to the customer but also enables the company's salesman to secure prospects from among the user's friends.

24. Promotional work with architects.

From the reports it would seem that not much has been done in promotional work with architects. A few companies, however, have understandings with local architects who draw plans for apartment houses. One company suggests that the best way to promote architects is to sell them electric ranges for their own use. The companies on the Pacific Coast believe that the Red Seal idea has materially helped their electric range sales.

---

customers at least be given a fair opportunity to use an electric range?

In the matter of selling electric ranges on rural lines eleven of the 24 companies apparently have not and do not contemplate the sale of electric ranges to their farm customers. It would seem that nearly half of the 24 companies are overlooking one of the best possibilities for giving the farmer the full advantage of electric service and at the same time boosting the energy consumption to a point profitable to the utility and advantageous to the customer. Furthermore, many companies are not taking full advantage of possible support from domestic science schools, the women's committee of the N.E.L.A. and the benefits of cooking schools.

A hopeful indication is seen in the attitude toward overworking the campaign method of selling. A number of companies have found that the reactionary slump following the stimulation of a campaign just about offsets any benefits derived and there is therefore a tendency toward continuous selling. Some advantage may be taken of seasonal characteristics, with special stress during the spring and fall.

Taxes About 9.6 per Cent of Revenue

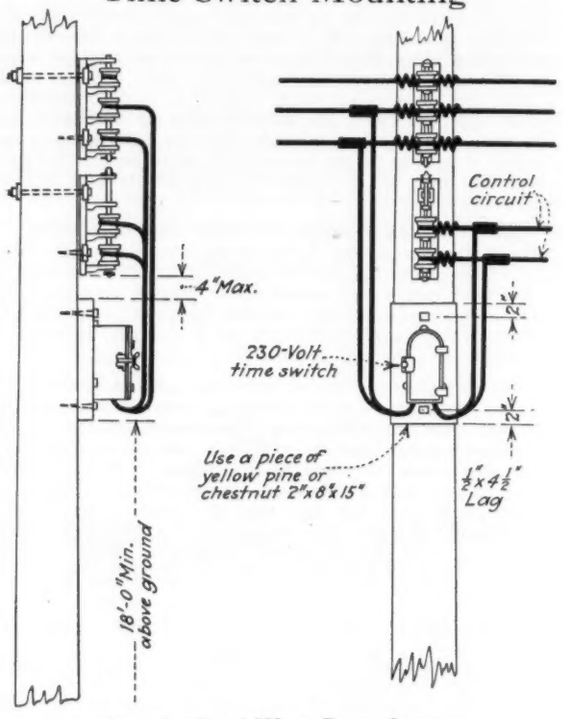
THE very considerable extent to which electric light and power companies have been utilized for the task of helping to collect national, state and local taxes is evident from a review of the operating revenue, operating expenses and taxes in those states for which the necessary data are obtainable from official sources.

The preparation of the accompanying table has been made possible primarily through the courtesy of public utility commissions, supplemented by data from published commission reports. An effort was made to cover every state in the Union in this survey, but owing to the lack of jurisdiction of commissions in some of the states the securing of complete data was impossible. However, the figures here presented account for about 64 per cent of the operating revenue of the industry during the year in question, 1926, and in view of the circumstances that municipally operated utilities are in most instances omitted the percentage of commercial companies is, in fact, somewhat greater. The omission of municipal systems, which usually pay either no taxes at all or a smaller percentage on their operations, makes the ratios deduced fairly representative of the situation for the commercial companies.

As might be expected, there is quite a wide variation between the states, but certain general conclusions may readily be drawn. Nearly 10 cents out of every dollar paid for electric service goes for taxes. For the states tabulated taxes consumed 9.6 per cent of the operating revenue. Assuming that the same ratio holds for the missing states, it follows that the industry paid, in 1926, about $160,000,000 in taxes. If the figures for Kansas are not added in, on the supposition that the inclusion of one-town companies in that state might affect the ratios, the total revenue for the remaining states becomes $1,026,163,248; operating expenses are $543,515,355; taxes, $99,303,840. The ratio of taxes to revenue then rises slightly, becoming 9.7 per cent.

Another striking feature is the relatively low revenue in proportion to valuation. Data on assessed valuation were not in all cases obtainable. In some a related figure, such as capital investment, could be secured. Here again the ratios vary among the states, but, taking all the figures in the valuation column together, regardless of the difference in basis, the average for the eleven states reporting on that item is $4.32 per dollar of revenue. The totals are: Valuation, $1,725,596,730; revenue, $399,780,862. The estimated total capitalization of the electric light and power industry in the United States corresponds to $5.40 per revenue dollar. The two ratios are in reasonable agreement, since assessed valuations are almost of necessity well below the actual cost of the property in question.

Time Switch Mounting



Standards of West Penn System

Electric Light and Power Industry Financial Data, by States, 1926

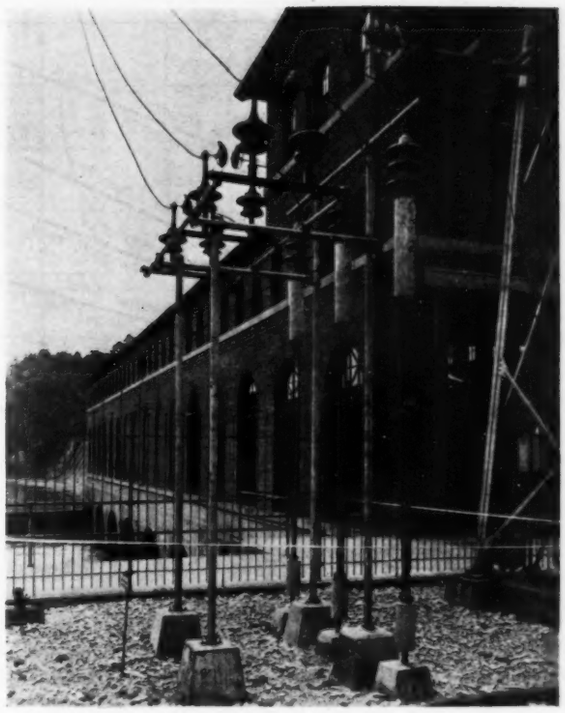
State	Assessed Valuation	Operating Revenue	Operating Expenses	Taxes	Ratio of Taxes to Revenue, Per Cent	Remarks
Alabama	$151,987,815	$20,575,780	$9,436,566	$1,373,917	6.7	Municipals not included
California	*765,399,676	101,176,751	45,223,807	11,069,036	10.9	*Capital investment.
Connecticut	Not available	28,993,722	16,546,145	2,274,207	7.8	
District of Columbia	*36,139,724	7,931,095	3,491,790	928,839	11.7	Private companies. *Value upon which rate of return is computed
Idaho	20,257,963	4,949,090	2,027,237	520,932	10.5	Municipals not included
Illinois	Not available	129,927,875	72,688,964	11,203,339	8.7	
Indiana	Not available	45,444,558	24,559,359	3,243,569	7.1	
Kansas	42,467,000	25,614,987	14,403,015	1,271,794	5.0	Includes no municipals nor private companies serving only one city or town
Maine	Not available	9,871,865	4,428,972	749,947	7.6	
Maryland	Not available	29,250,953	13,846,636	*2,493,156	8.5	*Includes $36,546 applicable to gas and electric property which is not segregated
Massachusetts	*182,507,185	77,734,689	42,089,916	*9,597,691	12.3	*Municipals not included
Michigan	Not available	*74,213,571	40,543,795	7,157,181	9.7	*Includes $17,894 revenue of the Champion Copper Company with no expenses given
Nevada	3,493,045	1,819,912	1,285,423	191,146	10.5	Municipals not included
New Jersey	Not available	60,216,183	32,896,012	6,264,146	10.4	Non-municipal
		1,005,372	634,652	.....	....	Municipal
New York, up-state	Not available	106,181,211	55,795,500	9,833,716	*9.5	*State average
New York City	Not available	131,021,348	76,150,127	12,639,873	....	
Ohio	*429,065,046	106,736,095	56,895,953	10,980,296	10.3	Municipals not included. *Capital investment
Oklahoma	24,472,569	15,028,015	7,440,568	1,085,676	7.2	Municipals not included
South Carolina	Not available	12,574,776	6,972,749	*1,700,298	13.5	*Approximate figures
Utah	Not available	10,277,549	3,666,841	1,351,179	13.1	Municipals not included
Vermont	Not available	13,018,390	6,459,678	1,041,359	8.0	Does not include Brownsville Electric Light Company
Virginia	18,554,857	16,400,241	9,040,355	1,498,559	9.2	
West Virginia	51,251,850	21,814,207	11,394,310	2,105,778	9.6	Municipals not included
Totals		1,051,778,235	557,918,368	100,575,634	9.6	

Draining High Voltages

from Lines

New device uses resistance column of electrolyte inclosed in composition tubes. Construction and operation

By CHARLES E. BENNETT
General Engineer Georgia Power Company



Drainage devices installed on a 22-kv. line using disk gaps and pipe frame support

THE question of lightning protection is one of great interest at the present time and much of a very technical nature has been written recently on this subject. There are, as a general rule, only four typical layouts of construction to be protected. In Fig. 1 *A* it is assumed that the line is highly insulated as compared with the terminal steel structure of the substation or generating station, but Fig. 1 *B* is one in which the line conductors are supported on steel towers or poles and where the substation is insulated much better than the line. In Figs. 1 *A* and *B* it is assumed that the substation or power house is at the end of the line. Fig. 1 *C* indicates a well-insulated line of wood pole construction and, connected to it, a lower insulated steel substation in the middle of the line or a part of it. Fig. 1 *D* shows a steel tower line with the substation of higher insulation than the line. In Figs. 1 *C* and *D* the stations are located in the center or a part of the line and in which a line extends beyond them. In Fig. 1 *A* it is apparent that the arrester should be located close to the steel structure so as to protect the weak link of the combination and its valuable equipment. In Fig. 1 *B* the opposite is necessary, for the reason that the insulation of the line is of lower flashover value than that of the substation, and as a result protection to the line is apparently essential. In this case the high induced potential will not travel far on the line as the substations are materially better insulated than the line and it will flash over and relieve the stress before damage is done to substation equipment. Each insulator support can therefore act as a safety valve. In Fig. 1 *C* it is necessary to locate arresters or drains on each side of the substation equipment in order to have full protection. In Fig. 1 *D*, if the line is to be protected from flashovers, the ideal layout would be to distribute arresters along the line.

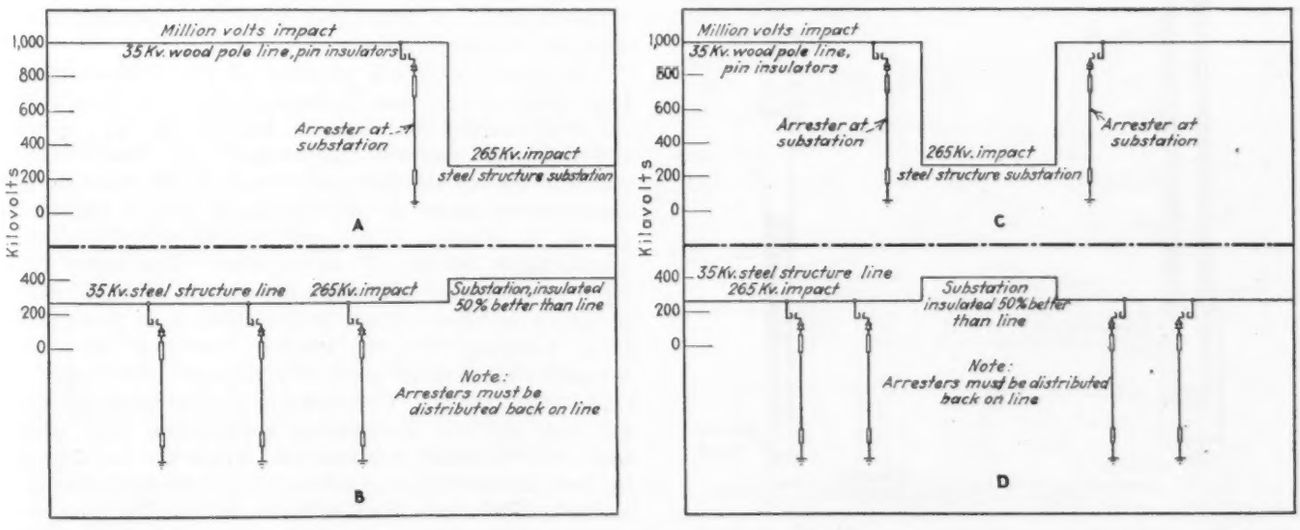


Fig. 1—Typical line and system layouts

A—Line highly insulated relative to terminal steel structure.
B—Terminal structure highly insulated relative to line.
C—Wood-pole line with steel terminal structure.
D—Steel tower line with highly insulated terminal structure.

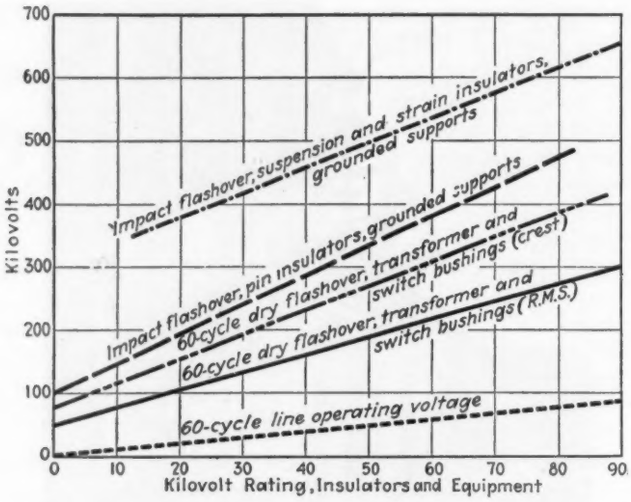
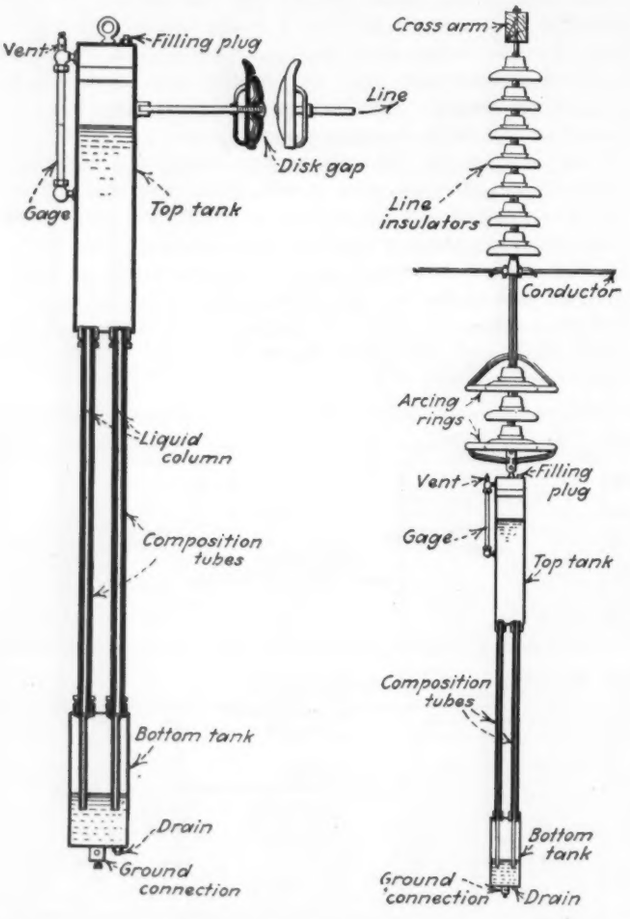


Fig. 2—Relative values for impact flashovers on lines of 15 kv. to 85 kv.

In Figs. 1 *A* and *C* the dead end stations are subjected to more severe conditions than *B* and *D*, as the voltage may rise to double the incoming potential when the transformer acts first as a condenser and later as an inductance.

In simple words, the problem is this: The incoming lightning voltage must be reduced from the impact flashover value of the line to a potential below the flashover of the equipment to be protected.



Figs. 3 and 4—Details of construction of station type drain device for line protection and installation of line type drain device on a line

As in Figs. 1 *B* and *D*, distributed drains along the line may prevent frequent flashovers, so detrimental to good operation. The impulse flashover value of the insulation on the line is known and the insulation value of the transformers, the bushings and station equipment is also known. The problem now is to drain the potential from the station if the line insulation is higher than that of the station and to drain the lines if the station equipment is of higher insulation than the line. In the first case it is much easier to protect the station than it is to attempt to protect the line. This applies solely to induced potentials and not direct strokes, as experience has been that it is not economical to protect against a direct lightning stroke.

Principle of New Protector

A new type of drain has been developed for the purpose of freeing the lines from impulse and high-frequency potentials that are above the normal transmission voltage and frequency. This device has many interesting features, both in its construction and operation. It consists essentially of a high-speed gap and liquid current-limiting resistance columns in series with the gap. The gap is a compensated impulse gap and was described in an article appearing in the Electrical World, May 27,

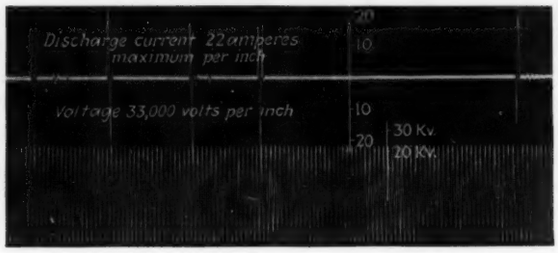


Fig. 5—Oscillogram showing five discharges on the drain device

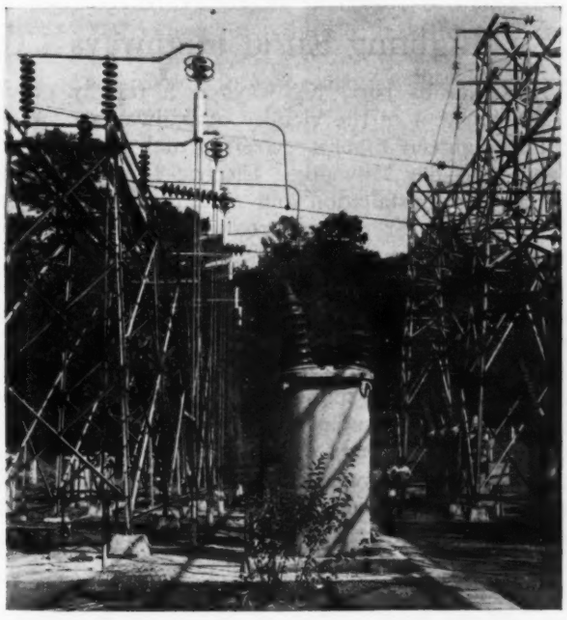
1922, and subsequently explained again in a paper before the American Institute of Electrical Engineers at the spring convention, April 7, 1924. The gap has the unusual characteristic of having the same arc-over value when wet as when dry, and has a somewhat lower arc-over value under impulse or steep wave-front potentials than for normal line frequency. The gap does not require housing or protection from the weather, since weather conditions do not affect its rating.

The liquid resistance columns of this arrester act as high-speed current interrupters and function to limit the 60-cycle current that usually follows the high potential discharge over the compensated gap which is connected ahead of the arrester. These liquid columns are connected to tanks at the top and bottom. The tanks contain a solution of calcium chloride which does not freeze above 50 deg. F. below zero. The upper tank has a suitable gage to indicate the amount of liquid in the container and has suitable baffles above it to prevent the liquid escaping when the arrester functions. It is also vented at the top to allow any pressure that might be generated to escape. Connected to the bottom of this tank are two specially constructed composition hose which make the resistance columns and which are not affected by the calcium chloride solution nor by electrochemical action. While two hose sections are usually used, any number of them can be used in multiple, as they function simultaneously while the apparatus is in operation.

The hose for the columns is $\frac{7}{32}$ in. inside diameter and

has a wall about $\frac{3}{4}$ in. thick. The lower ends of the hose are connected to the bottom tank, which forms the ground terminal of the device. The lower tank has in it a small air chamber, as shown in the cross-section view, to act as an air cushion and to aid the rapid operation of the device.

The operation of this apparatus in relieving the lines of high potentials is as follows: The impulse potential breaks down the gap and energy flows through the top metallic tank into the reservoir containing the highly conducting liquid and through the hose filled with the electrolyte to the bottom tank, which is, in turn, connected to the ground. If the 60-cycle dynamic current follows over the gap as it usually does, it is cut off by the interrupter action in the hose column. The interruption takes



Drainage devices of line type installed at 110-kv. terminal station using suspension ring gaps

place because a small portion of the electrolyte is changed to vapor very rapidly and this results in a path of high resistance with unstable liquid electrodes on both sides of the vapor. This condition has a very definite and quick interrupting action on the dynamic current. Oscillograph records show that approximately one to two cycles are required to quench the arc at the gap. An oscillograph record of the action is shown in Fig. 5. If a surge is of very large energy content the worst that can happen is the bursting of a hose because of the quickly generated vapor and its resulting pressure effect. For surges of low energy content the resistance column acts as a slow drain for the excess potential.

Another interesting feature of this arrester is its rapid change in impedance under different voltages, as indicated in Fig. 6. This also shows the relative discharge current under different voltages and impedances. For example, if an impulse voltage of 60 kv. be applied to the arrester terminals the surge impedance of the arrester will be about 430 ohms and the surge current flowing through the arrester will be about 140 amp. Should the impulse voltage be 120 kv. the surge impedance of the arrester becomes about 270 ohms and the surge current through the arrester will be about 445 amp.

Some of the advantages of this type of protective device are as follows:

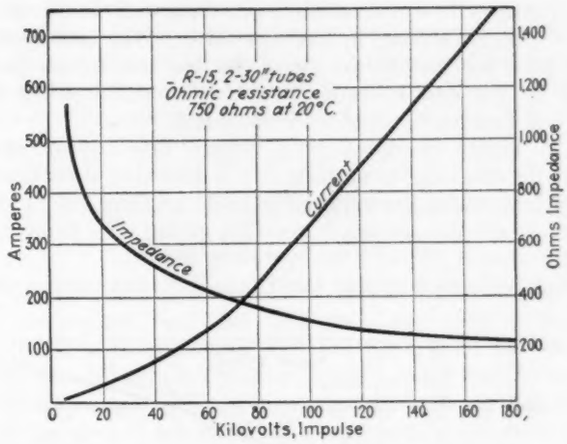


Fig. 6—The impedance of the electrolyte decreases as the voltage increases

1. Due to its rather high 60-cycle resistance, the gap is set for only 10 per cent above line voltage, as frequent spillovers are not detrimental to the device. This means less energy to every high potential discharge as the drain acts at low values of surge voltage and tends to prevent an accumulation of charge.
2. The current discharge increases with increase of voltage and does not follow Ohm's law because of the change in impedance of the electrolyte.
3. The surge energy is better dissipated from a system by distributed resistances and, due to low cost, this device is economical to use at short intervals along a line.
4. Any surge impedance to ground that may be desired is possible by adding additional tubes to the resistance column.
5. It cannot be an operating hazard because a broken tube simply opens up the ground connection.
6. It can be tested at any time by short circuiting the gap with an insulated stick.

General Features of Application

Two general types of this arrester have been developed, the station type and the line type. Assuming a potential gradient of 50 kv. per foot for a line, we have approximately 1,500,000 volts on a line 30 ft. high and

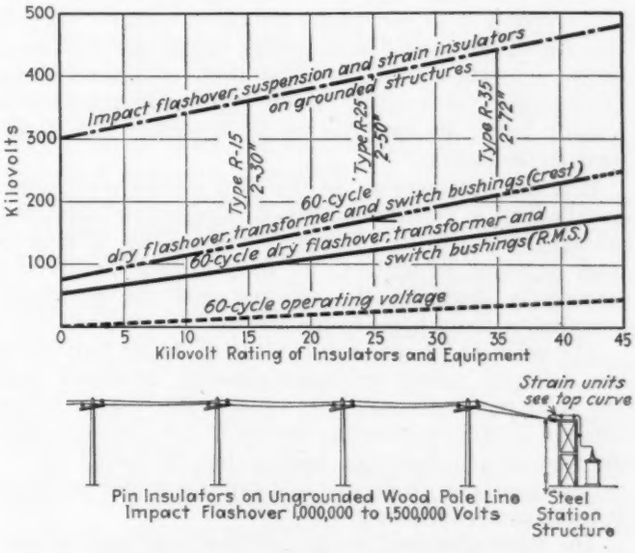


Fig. 7—Wood-pole line with drainage device installed to protect substation equipment

steel lines with low insulation will flash over insulators at this value, resulting in bad operation. The line type is designed for installation along the line at intervals justified by the cost of remedying this condition when the several factors involved are considered.

On highly insulated lines, where tapered insulation near the receiving or sending end is desirable, these drains may be used on the approaching two or three tower supports where flat spacing is possible, giving ideal protection to the station and with no operating hazard.

Fig. 7 shows a typical wood-pole line construction with

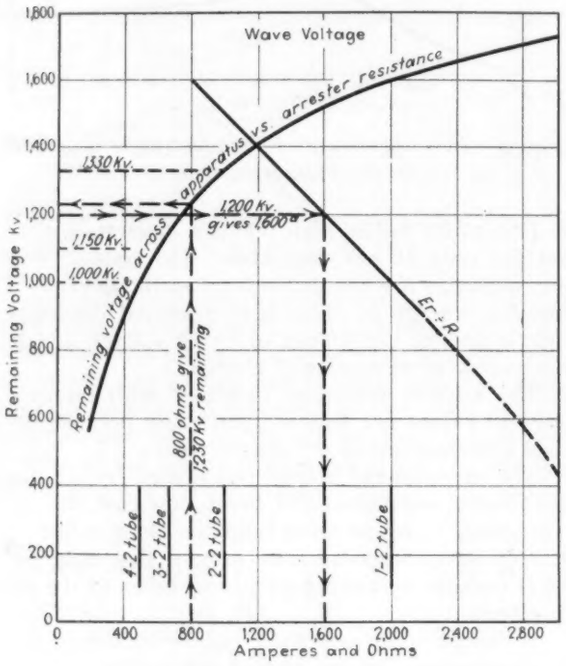


Fig. 8—Relative effect of multiple electrolyte columns on surge potentials

conductors more than 30 ft. above the ground. The impact charge on such a line will reach 1,500,000 volts, providing no weak link in the insulation is present to prevent such a rise. If no arrester equipment is present the weak link for limiting this potential will probably be the dead end strain unit at the substation frame, and this will probably flash over under the circumstances. In this case the device should be connected to the line just ahead of the substation frame in order that full protection be given to the substation by limiting the impact potential to a value below the flashover on all insulators and equipment in the station.

It is not necessary to set the gaps widely apart when installed at a generating station where line operating voltages may rise to 150 per cent more due to loss of load or other conditions, as such a rise would only continually discharge the arrester until the governors operated, without harm to the arrester.

The value of low gap settings (10 to 20 per cent above line voltage) cannot be underestimated, as waves with low crest potentials may pass considerable energy by an arrester of wide gap setting before it operates and reach the transformer bushings, having time to charge up the various capacities to ground and causing double potential at transformer terminals.

The much-discussed subject of discharge rate is definitely settled in this new type of drain as its surge impedance values can be lowered by the use of as many multiple tubes in each ground leg as may be desired or required for this purpose.

Fig. 8 shows the relative values for different multiples in reducing a 2,000-kv. wave of two microseconds. For example, if one tube is connected to the line the surge voltage will be reduced to 1,600 kv. and if four tubes were connected in parallel across the line the voltage would be reduced to 1,000 kv.

Where the reduction in voltage for lower insulated lines is necessary the shorter tubes have lower surge impedance and therefore less resistance and more shunting effect. It is well known that the dissipation of transients through resistance in the form of heat is the ideal way of reducing the potentials of harmful surges, and this is accomplished by this device.

Lighting Rural Highways

LIGHTING of rural highways is a rapidly growing development in the vicinity of Milwaukee. Within the last eighteen months governmental units have arranged with the Milwaukee Electric Railway & Light Company for installation and maintenance of highway lights. Last year Milwaukee County contracted for illumination of prominent highway intersections.

The most significant step, however, has most recently been taken by the town of Lake, a partly suburban and partly rural township adjoining the city of Milwaukee to the south. This township has decided to illuminate every street corner, highway intersection and railroad crossing within its confines. In addition, it will light its main country highways with lamps every quarter mile. The program will make this the most brightly lighted township in Wisconsin. Three hundred and seven lamps are to be installed with a combined brilliance of 124,600 cp.

The illumination program results from the recent action of the town electors in approving establishment of a $200,000 fund to provide "a complete and modern highway lighting system." The fund is expected to finance the cost of such lighting for twenty years. Preliminary work on the new lighting system is already under way and actual installation will be started within a month. The lamps are to be of the incandescent type and arranged in size according to the need of the place to be lighted. Plans call for 81 lamps of 600 cp. each, 130 of 400 cp. and 96 of 25 cp.

The New 10-Watt Lamp and Central-Station Revenue

By M. Luckiesh
Director Lighting Research Laboratory, National Lamp Works, Nela Park, Cleveland, Ohio

IN RESIDENCES the opportunities for using the new 10-watt small-bulb, intermediate screw-base tungsten lamps are largely in the decorative field. However, it has some purely utilitarian uses, such as in night lights, in illuminated house numbers and certain other lighting equipment, in which it is particularly suitable owing to its small physical dimensions. When employed for such purposes the lamps may easily be used about 1,000 hours a year.

Under this condition the 10-watt tungsten lamp competes very favorably with the common household appli-

ances as a revenue producer for central stations. From data which we have available we have determined the number of these 10-watt lamps which should produce as much revenue per year as various electrical appliances. If only "average sockets" are assumed the number of lamps must be trebled.

No. of 10-Watt Tungsten Lamps	Kw.-Hr. Equivalent
2	1 clothes washer
3½	1 grill
4	1 toaster
7	1 iron
4	1 percolator
2½	1 cleaner
3	1 fan

This apparently insignificant 10-watt lamp opens a new field and it is interesting to note that two of them in "active sockets" in each wired home in this country would increase the central-station revenue as much as the completion of the present iron or washer field to a saturation point.

Refunding Customers' Deposits

By J. W. Williams
Director of Public Relations
Binghamton Light, Heat & Power Company

GREATER public confidence and good will have been established by adopting the policy of refunding customers' deposits. This policy was started about a year ago. First, all deposits made previous to 1923 were refunded with 6 per cent interest to all customers who had established their credit by paying bills promptly for the past fourteen months. After this series was refunded, deposits made in 1924 and 1925 were refunded on the same basis. For the present we are continuing to refund deposits on a two-year basis.

The deposits were refunded in geographical order to prevent any run on the local office with inquiries as to why certain customers did not receive a refund while others did so.

A letter is inclosed with the deposit check which has an appended form of deposit release attached, in case the customer has lost the original receipt which was issued when deposit was made. More than $13,000 has been refunded during the past year and more than $3,600 paid in interest. In spite of these refunds the deposits have been reduced only $4,700 over deposits carried a year ago.

Hundreds of letters have been received commending our policy in refunding these deposits. All express the same sentiment as the few excerpts quoted:

Thank you for fine service and fair dealings to the rural folks in Willett.

I never did just understand what this deposit was for and had always assumed that it was a forfeit for taking on the light and power. I see now, however, that I was mistaken and apologize for the inadvertent omission of the perspective that should prevail when an individual is permitted by a corporation to do business with an honorable company.

I have made a research in the archives—I don't locate the receipt. If the inclosed receipt is not satisfactory I will refund the six dollars and twenty cents.

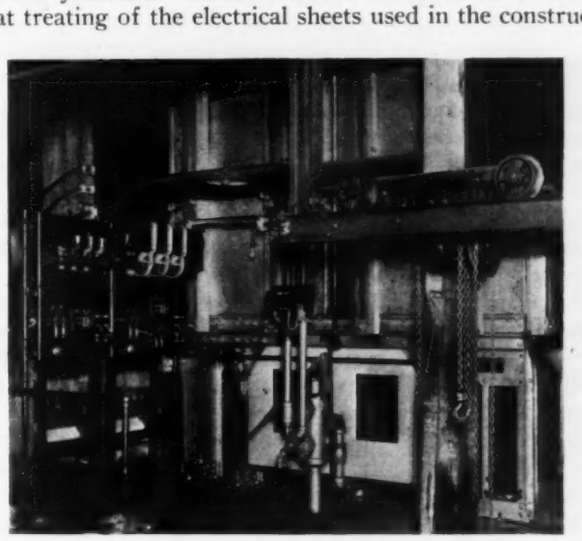
I am inclosing receipt for my deposit which you have returned to me.

I cannot pass up the opportunity to congratulate the management of your company on its wisdom in doing things like this, which break down the impersonal attitude that has always been one of the main causes of misunderstanding between public service corporations and the people whom they serve.

In addition to these favorable comments a study of conditions reveals that customers who were in the habit of paying their bills every two or three months are endeavoring to pay bills monthly in order to establish their credit so deposit may be refunded.

Century Electrically Anneals Lamination Sheets

SOME manufacturers using electric sheet steel for laminations find that they must pay close attention to the kind of steel used and the method of processing after receipt, otherwise the magnetic losses may be more than they should. To secure more accurate and uniform heat treating of the electrical sheets used in the construction of its products the Century Electric Company has recently installed in its plant in St. Louis an elevator-type electric furnace for annealing lamination iron. This furnace was supplied by the Gas Equipment Engineering Corporation. The material cars are moved to and from the furnace by standard squirrel-cage motors. The load is hoisted into the furnace or removed by a hydraulic elevator.



Elevator-type electric annealing furnace with control panel at left

While one load of steel is being treated, the next load is prepared so there is little delay between heat cycles. This relatively continuous operation enables the furnace to work at a high efficiency and without the deterioration which comes from alternate heating and cooling when less rapid operation is employed.

The load of hot sheets when removed from the furnace is pushed to the end opposite the loading end and covered with a hood for the purpose of controlling the oxidation of the metal while cooling. Approximately eight hours is required to heat a charge and about six hours for cooling. The two hours' difference between the heating and cooling time is sufficient to carry on loading and unloading with two cars. The furnace will accommodate the car and approximately 6 tons of steel, giving it a capacity of 18 tons daily.

The heating elements are divided into two 75-kw. sections. When the furnace is first loaded the two heating units are operated in parallel until the iron reaches the proper annealing temperature. From that time on the temperature is maintained and radiation losses are offset

by one heat element alone. Heat control is entirely automatic, being handled through thermocouple pilots and automatic control panels.

Since the furnace has been in operation it has been found to have four definite advantages over other methods of annealing electrical sheets: (1) Reduced iron losses; (2) increased permeability; (3) less oxidation losses; (4) decreased cost of annealing.

Financing Street Lighting

"IT IS desirable for central stations to provide two plans for financing street-lighting installations," said L. A. S. Wood at the recent convention of the Missouri Association of Public Utilities, "one for lighting units with overhead construction and the other for lighting units with underground construction. For overhead construction with suspension units a flat rate should be established which would include, besides the operating and maintenance costs, the interest and depreciation on the equipment and its installation. Owing to the comparatively small initial cost of suspension units and overhead construction," said Mr. Wood, "this plan does not impose any undue burden on the annual rate and the fixed charges are reasonably small.

"For underground construction with ornamental units experience has shown that this class of service can best be developed with a flat rate which includes operating and maintenance expenses only, with no provision for interest and depreciation on the equipment which would be installed and financed by the municipality." Mr. Wood recognized a considerable difference of opinion among operating men in regard to the latter plan, but stated that it is quite evident that since the municipality pays its bills out of annual appropriations for street-lighting maintenance the city will have more money available for the purchase of street-lighting service if the street-lighting rate is relieved of the burden of the fixed charges incident to expensive underground construction. In some cases the fixed charges were estimated to amount to as much as 60 per cent of the total rate. Mr. Wood also suggested that when a municipality pays for the installation it is financed by a bond issue, assessment of abutting property owners, public subscription or by some other means, but never out of the annual maintenance budget for street lighting.

Customer-Owner Growth in California, Utah and Arizona

Company	—Customer Owners— 1918	1922	1927	Approx. Value of Securities, 1927
Southern California Edison Co.	3,300	43,000	102,000	$130,000,000
Pacific Gas & Electric Co.	*4,670	18,076	39,374	92,353,000
Utah Power & Light Co.	.....	2,422	10,242	13,992,000
San Joaquin Light & Power Corp.	.....	*5,417	*5,938	4,193,000
Los Angeles Gas & Electric Corp.	.....	3,102	4,765	9,814,000
Great Western Power Co.	.....	.....	*4,270	3,500,000
Central Arizona Light & Power Co.	.....	228	665	470,000
Totals	7,970	72,245	167,254	$254,322,000

*Approximate.

Fundamental Economics of Rural Service Declared

AN ECONOMIC platform for rural service development was recently prepared for the New England Council by the co-operating committee on farm power, headed by Samuel Ferguson, president of the Hartford Electric Light Company, other public utility representatives being F. A. Belden of the Edison Electric Illuminating Company of Boston and J. W. Leland, agent for rural lines Central Maine Power Company, Augusta, Me. Discussion has been invited by the committee from members of the council. The platform follows:

1. It is not economically sound that the rural user should be permanently served at a loss with consequent burden to other customers, nor does the rural customer desire such a subsidy.

This involves one of two alternatives—either the rural customer shall use a sufficient excess of current over the average use to carry the excess line costs or he should pay the fixed charges on the excess of line costs which his service requires.

2. It is not essential that the rural customer should pay his full cost from the start provided his business can be built up to self-sustaining proportions within a reasonable period.

This means, just as in the case of the development of any new business, the existing customers bear the cost of the development period with the expectation of ultimate benefit to themselves.

3. To develop the business to self-sustaining proportions, it is essential that a low price be offered for use of current in excess of the average used by the urban customer, otherwise the cost of liberal use is prohibitively high.

This makes essential the use of a two-part rate having a low energy charge.

4. It is preferable that the customer should not pay any part of the cost of the line extension because his available funds should be conserved for the purchase of electrically operated labor saving machinery. If customers furnish poles and labor, same should be paid for and cost charged to the line.

5. The customer who intends to use liberally should be allowed a resonable time in which to build up his use of current without being burdened at the start with payments as large as a reasonable guarantee would require.

This can be readily accomplished by a graduated guarantee rising from nothing to a self-sustaining figure over a period of five years.

Letters from Our Readers

Resents Indictment of Lower Quality

To the Editor of the ELECTRICAL WORLD:

On page 1019 of the May 19 issue of the ELECTRICAL WORLD there appears a communication entitled "Price Squeezing and Impairing Quality," and as a manufacturer of high-tension equipment we are obliged to take issue with this statement. Price and profits are low, but a charge or even an intimation that all manufacturers are lowering their quality is untrue and we will not submit to such an indictment.

In this highly competitive era the only way to meet conditions is to improve a product steadily and at the same time, by means of improved methods, reduce its manufactuing cost. The manufacturer who is not doing this today is a horse and buggy traveler on a high-speed highway and bound to trail behind. The manufacturer who blindly tries to produce equipment under the same conditions his "Uncle Ezra" did ten years ago, in the days of long profits, is pretty close to the border line of industrial sensibility.

As for us, full steam ahead with better and better equipment.

H. W. YOUNG,
President.
Delta-Star Electric Company,
Chicago, Ill.

Digest of Electrical Literature

Transmission, Substations and Distribution

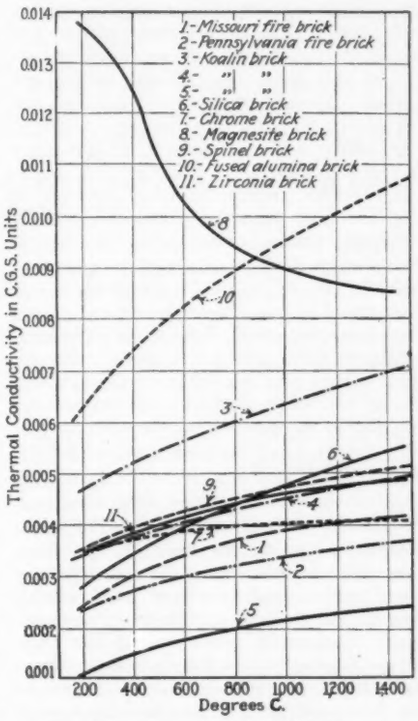
A.-C. Substation Design Practice—1927.—The principal features of alternating-current substation practice among the member companies of the N.E.L.A. as evidenced by stations designed or constructed in the period following the release of a similar report for 1925 are covered in this discussion. The subject has been divided into three sections: Attended transmission, attended distribution and full automatic substations. Simplified plans, cross-sections, one-line diagrams, use of electrical equipment and devices and tabulations of substation details are included. Among the indicated tendencies are: An increasing use of automatic substations; segregation of equipment operating at lower voltages; the use of three-phase, four-wire, 4-kv. circuits for distribution involving several varying practices for switching and operating work; appreciation of the reliability and operating advantages of self-cooled transformers, and a definite tendency toward outdoor substation design.—*Serial Report National Electric Light Association,* April, 1928.

Design Theory of the Transformer.—M. VIDMAR.—The author claims that all known theories of transformer design suffer under the inaccuracy involved in determining exactly the fill-factors of iron cores and windings. To eliminate these, a new method is presented in this paper, in which iron and copper are introduced by weight only. To obtain the most economic design certain definite ratios must be maintained between dimensions, losses and costs. These ratios are mathematically derived in a logical manner and lead to the final conclusion that the expenditures for active materials in a transformer become a minimum when the cost of the iron core is as much higher than the cost of the winding as the losses in the copper are greater than the iron losses.—*Elektrotechnik und Maschinenbau,* April 15, 1928.

Hydro-Electric Development and Steam Equipment

Fluid Governors for Prime Movers.—HENRY F. SCHMIDT. — The pressure-volume characteristics of the three well-known types of centrifugal pump runners offer the basis for this discussion of fluid governors. This article, which is one of a series, offers a consideration of the effect of temperature and atmospheric pressure; methods of compensating for physical characteristics of media; method of supplying fluid to the pumps, and similar factors of significance in such work. It is stated that for ideal conditions the governing device itself should be mounted on and be a part of the main turbine shaft without the intervention of gears, links or moving parts. No sliding parts between the governor and the valve-operating mechanism should be included; the connection between the rotating and stationary parts should be through the oil pumped by the impeller.—*Electric Journal,* May, 1928.

Properties of Refractories and Their Relation to Conditions in Service.—STUART M. PHELPS.—An analysis of the physical properties of various refractory



Relative thermal conductivity of refractory materials

materials and their service characteristics has been prepared by the author. The results of a number of investigations have been compiled and tabulated with particular reference to strength, resistance to destruction and confinement of heat properties. The resistance to destruction has been classified to include abrasion, slagging, spalling and melting of the material.—*Transactions of the American Society of Mechanical Engineers,* January-April, 1928.

Peak-Load Equalization in Power Plants by Ruths Steam Accumulators.—J. TOBOLLA.—The influence of fluctuating loads upon the economy of steam and water-power systems is discussed with special emphasis on the question of amortization and interest charges. The author has directed particular attention to the economic value of the steam accumulators of both the variable pressure and constant pressure type.—*Journal of the Institute of Electrical Engineers of Japan,* April, 1928.

Units, Measurements and Instruments

Electro-Dynamometer with Nearly Uniform Scale.—D. I. BUBERT.—Electro-dynamic voltmeters or ammeters have a stationary and a moving coil. Passing the measured current through these two will cause attraction, which is proportional to the product of current times field density, or the torque in any one point is proportional to the square of the measured current. The scale of such instruments will therefore be a quadratic division. By winding the stator coils in a peculiar, irregular moon-shaped cross-section, embracing completely the path of motion of the rotor coil, the author succeeded in so distributing the stationary field as to make the torque almost directly proportional to the passing current. The new instrument has 172.5 amp. turns on the stator and 15 amp. turns on the rotor coil. The 150 voltmeter consumes 0.9 watts. Neglecting the difference of one-tenth per thousand, the calibration is the same for alternating current or direct current.—*Elektrotechnik und Maschinenbau.*—April 22, 1928.

Oscillating Meters.—D. BROIDO.—Direct-current watt-hour meters, based upon the oscillating principle, were among the first to achieve practical use. Their great simplicity and approximately nine times longer life prompted designers in recent years to improve and to modernize them, with the result that a new line of oscillating meters is now available, exceeding in accuracy the established motor type meters. While this new model can be made to operate either across a shunt or directly in the line, it is the latter application where the new meter excels. Models for up to 10,000 amp. are available, which can be mounted directly upon the busbars, with no interruption of the bar. A 5,000-amp. meter starts at 30 amp. and has an inaccuracy of less than plus ½ per cent. Simplicity of mounting, no watt loss in a shunt, practically no temperature correction, readily possible recalibration and a maximum of measuring accuracy are the chief advantages of this new type.—*Elektrotechnische Zeitschrift,* April 19, 1928.

Illumination

Four Fundamental Factors in Vision.—PERCY W. COBB and FRANK K. MOSS.—An experimental analysis of the quantitative interrelation of four characteristic variables of the visual object at the border of visibility, with a discussion of the applicability of the results in lighting practice which aims at clear vision. The four fundamental variables in a visual object as developed by the authors in this discussion are the size of its critical detail, conveniently expressed as minutes visual angle subtended at the

eye by the detail; the contrast between the object and its background, which may be defined as the ratio of the brightness-difference to the brightness of the background and for simplicity designated as per cent contrast; the brightness-level to which the object is illuminated, and the time during which the image of the object is allowed to rest upon the retina of the eye.—*Transactions of the Illuminating Engineering Society,* May, 1928.

The Manufacture and Properties of Glass and their Application to Illuminating Engineering.—S. ENGLISH.—The various properties of glass as related to its lighting application have been considered by the author with particular reference to the factors of transparency and color, diffusion qualities, opalescence and frosted coating.—*Journal of Good Lighting (England),* May, 1928.

Motors and Control

Synchronized Asynchronous Motor.—J. L. MONNIER.—A French steel manufacturer has installed a 2,000-hp. synchronized induction motor for the direct drive of a six-pass blooming mill. The machine has a normal speed of 167 r.p.m. and is directly connected to a 600-amp., 60-volt direct-current exciter. Overloads of up to 4,000 hp., such as may occur during the rolling process, can be readily delivered without the danger of falling out of step. Considering only the mechanical output of the motor, an efficiency of 92.8 per cent can be reached. But since the motor can furnish simultaneously up to 1,200 kva. reactive power, correcting the phase displacement caused by other motors in the mill, an electric efficiency of 94.7 per cent has been recorded. Characteristic curves and vector diagrams are given to explain the exact operation of this motor, which is claimed to be the largest of its kind.—*Revue Générale de l'Electricité,* April 21, 1928.

Heat Applications and Material Handling

Molybdenum Furnace.—P. W. DÖHMER.—Platinum begins to evaporate at a temperature of slightly more than 1,300 deg. C. If higher degrees of heat are required for certain chemical or electrometallurgical investigations heating units of platinum wires cannot be used. A German concern has found molybdenum wire to be suitable for temperatures up to 1,500 deg. C., provided the surface of the wire is prevented from oxidizing. It was customary to establish around the heating unit an atmosphere of hydrogen or water gas, but methods of supplying these gases and making necessary hose or pipe connections were found cumbersome. The new method provides on the furnace a small vessel with methylated alcohol. This liquid is made to drip slowly through a heated tube, in which it is evaporated, and the vapor so formed provides a steady stream of protecting gas around the molybdenum heating unit. One filling of the vessel is sufficient for an operation of two hours. The gas escapes through an exhaust tube and burns with a non-luminous flame. The maintenance of this flame is an indication of the proper functioning of the evaporator.—*Zeitschrift des Vereines Deutscher Ingenieure,* April 28, 1928.

Electrophysics, Electrochemistry and Batteries

The Drying and Storage of Secondary Battery Plates in the Charged State.—SAKEE MAKIO.—The results of a preliminary investigation to be applied to a general research on the best methods for preparing secondary battery plates fully charged in the dried condition are given in this report. A successful process of this kind, it is stated, will serve certain useful purposes, namely, the transportation of the battery without electrolyte and the saving on the part of the purchaser of the battery of applying the first charge to it. A number of positive and negative plates were fully charged, washed and dried in carbon dioxide gas, wrapped in paper and stored for six months. The tests upon which this report is based were made indicating the characteristics of these dried plates. Voltage time curves, specific gravity time curves and temperature time curves of the cell were studied upon immersing the plates in the electrolyte.—*Report of the American Electrochemical Society,* April, 1928.

Electrochemistry and Electrometallurgy.—W. W. E. FRENCH.—The electrothermal processes used in the fixation of nitrogen and in the manufacture of nitrogen products have been classified under electric arc process, the calcium cyanamide process and the synthetic ammonia process, while the electrometallurgy of iron and steel and of the ferro-alloys and non-ferrous metals have been offered a separate consideration. Electrolysis and the electrolytic refining of metals have also been considered.—*Journal of the Institution of Electrical Engineers (England),* May, 1928.

Telegraphy, Telephony, Radio and Signals

High Angle Radiation of Horizontally Polarized Waves.—S. UDA.—The results of experiments made to determine the directional property of horizontal antennas with special reference to the high angle radiation of horizontally polarized short waves have been described by the author. In these experiments short waves of 260 cm. length were employed and the sending antenna of nearly a half wave in length was placed horizontally above the ground. The receiving antenna forming a Hertz's resonator was also supported horizontally and made to move up and down along a vertical line by means of a pulley device The field intensity due to the horizontal antenna was measured in various angular directions above the ground by placing the receiver at various heights. It is concluded that if several wave directors are arranged in front of the radiating antenna along an inclined line, making a certain angle with the horizontal, the radiated energy along this line will become greatly augmented, due to the existence of wave directors, and the direction of maximum radiation will not strictly coincide with the line of directors, but will be of a somewhat higher angle than this line. It is stated that the sharpness of the beam can be much improved by increasing the number of wave directors.—*Journal of the Institute of Electrical Engineers of Japan,* April, 1928.

Miscellaneous

Electric Purification of Blast Furnace Gases.—M. KERALY.—Exhaust gases from blast furnaces represent a considerable calorific value and can be used for heating purposes or as fuel for internal combustion machines. The large amount of dust carried by these gases makes their direct use impossible. A thorough filtering process has to be carried on, to remove from 6 to 50 grams of solid matter from every cubic meter of gas. This represents a total of about 50 tons of dust per day from an iron output of 220 daily tons. Mechanical filtering processes are cumbersome, require water and are not thorough enough. The article describes modern electric dust precipitation with rectified 50,000-volt alternating current. Several installations on a large scale have demonstrated excellent results with a minimum of attendance. The purified gas does not contain more than an average of 0.013 grams of dust per cubic meter; that is, the precipitation removes up to 99.8 per cent of the solid contents of the gas.—*Bulletin de la Société Francaise des Electriciens,* Vol. 78, 1928.

Unusual Features in the Microstructure of Ferrite.—HENRY S. RAWDON and TORKEL BERGLUND.—Ferrite in the form of electrolytic iron, open-hearth iron and wrought iron is usually considered to have a very simple microstructure, but sometimes shows rather unusual features indicating that it may exist in various allotropic forms. It is stated by the authors that two of these features apparently related to the delta and gamma form of iron can usually be associated with tiny inclusions distributed in such a manner as to record the grain structure which existed in the high-temperature allotropic condition. A thorough investigation of the microstructure of ferrite has been undertaken and the factors affecting the material, including casting, heat treatment and mechanical deformation, have been considered, as well as the effect of "working" irons of different compositions. The results of tension tests of open-hearth iron at elevated temperatures and miscellaneous factors effecting the "veining" of the material are discussed. —*No. 571 Scientific Papers of the Bureau of Standards.*

News of the Industry

Promotional Rate Is Made General at Boston

Department of Public Utilities Modifies Boston Edison Company's Schedule B and Applies It to Domestic Customers in Metropolitan District

DOMESTIC consumers of electricity on the Boston Edison company system will save about a million dollars yearly, according to a decision of the Massachusetts Department of Public Utilities handed down on Wednesday of this week. Customers in Watertown, Somerville, Chelsea, Roxbury and other localities recently petitioned for a reduction in residential service rates. After a series of hearings the commission has reached the conclusion that the establishment of a zone rate would be undesirable at present; that if a flat reduction in the present maximum rate of 8.5 cents per kilowatt-hour were to be ordered, only 0.5 cent could be cut off, and that the proper course is to modify the company's so-called domestic lighting and appliance rate (Schedule B) so that the consumers and the company may enjoy in greater degree the advantages of an inducement-type rate.

Accordingly the board orders that after Aug. 15 the company's Schedule B shall be available for lighting and other domestic uses in residential premises, excluding hotels and apartments where the bills are not rendered by the company directly to the individual tenants. Under this schedule as modified by the board the rates are to be 8.5 cents per kilowatt-hour for the first 2 kw.-hr. per month per 100 sq.ft. of floor area, 5 cents per kilowatt-hour for the next 70 kw.-hr. per month and 3 cents for the excess, the minimum area being 1,000 sq.ft. This indorsement of the inducement-rate principle is regarded as highly important in Massachusetts utility circles. Various points discussed by the commission will be covered more fully in a later issue.

Elephant Butte Contract for El Paso Company

Following the withdrawal by the Texas-Louisiana Power Company of its proposal to construct a hydro-electric plant at Elephant Butte Dam, the boards of directors of the El Paso County Water Improvement District and the Elephant Butte district in New Mexico have signed the contract submitted by the El Paso Electric Company, subsidiary of the Stone & Webster interests, providing for the development of hydro-electric power at the dam. A co-operative agreement between the Elephant Butte and El Paso districts will be worked out at once, after which the contract will be submitted to the water users for approval. The Secretary of the Interior must also sign the contract.

A lease with the government for the development of power by the districts for a period of 50 years also was signed by the board of directors. It provides that after all expenses have been deducted in operating the plant the amount left shall be applied on the current bill of the districts to the government. M. H. Lewis & Company, Huntley & Company and the Merchants' National Bank of Los Angeles have submitted a proposition for financing the project. It is expected that the plant will be constructed speedily so that delivery of power can be started about the middle of next year.

Lightning on Conowingo Line "Never Touches" Service

A report from engineering sources says that the first real test of the Conowingo transmission system under lightning disturbance was had on Tuesday night, June 5, when what was apparently a direct stroke hit the line near Philadelphia about 10:30 o'clock. The steam units at Philadelphia took up the load immediately, it is reported, probably without more than a dip in lamp voltages. Conowingo at the time was delivering 185,000 kw., of which 150,000 kw. was being transmitted to Philadelphia. Apparently all the relays and governor equipment concerned functioned 100 per cent, and Conowingo was on full service again in ten minutes.

Two Years' Growth of the N.E.M.A.

Executives of Association and Delegates to Annual Meeting at Hot Springs, Va., Evince Satisfaction with Outlook for Its Growth and Usefulness

MORE than three hundred electrical manufacturers gathered at Hot Springs, Va., this week to attend the annual meeting of the National Electrical Manufacturers' Association. Though this organization is less than ten years old, it already has proved its value both to the manufacturers and to the entire electrical industry. In making this assertion President Gerard Swope declared that the manufacturing industry is now co-ordinated and articulate and that the N.E.M.A. is a necessary organization. He urged patience and still more patience in the development of the body, quoting figures and facts to show that the membership was increasing and that important work had been completed or started. Each of the divisional vice-presidents reported progress and expressed firmly a belief that the new organization is working out most successfully. A. E. Waller, the managing director, reported a good year. He said the headquarters staff had been increased to give engineering aid to the work of the association and emphasized the importance of section activities.

The five days at Hot Springs were devoted almost entirely to section meetings where men in each group of manufactured products discussed standardization, basic business policies and organization procedure. These meetings were well attended and much progress was made. There was only one general meeting. At it the addresses just alluded to by President Swope, Managing Director Waller and the vice-presidents of the divisions were made. Vice-President Clarence L. Collens of the Policies Division stated several national business policies which this division had discussed and stressed the elements of policy involved in the tariff and in legislation on industry and the interrelations of the N.E.M.A. with other industry groups.

According to the reports of the executives, the Apparatus, Radio, Supply and Appliance Divisions have much work under way and look forward to substantial achievements during the coming year. Standardization, cost accounting, industry statistics and market development were put forth as common objectives. W. E. Sprackling reported very favorably on the work of the Industry Trades Conference.

H. B. Crouse was elected president for the coming year. The divisional vice-presidents elected were as follows: Apparatus, N. A. Wolcott; Appliance, M. C. Morrow; Policies, C. L. Collens; Radio, L. B. Raycroft; Supply, W. E. Sprackling. Members of the board of governors elected for three years were H. B. Crouse, R. Edwards, A. L. Eustice, Otto H. Falk, W. L. Jacoby, J. M. Curtin, D. H. Murphy, R. J. Russell and Frank E. Wolcott. I. A. Bennett was elected a member of the board for one year.

Radio Division, N.E.M.A., Has Session at Chicago

Meeting at Chicago on June 4 to 7, the Radio Division of the National Electrical Manufacturers' Association went on record as favoring the early adoption of the engineers' plan of broad-

casting allocation by the Federal Radio Commission and the increased use of higher power by broadcasting stations. Publication of "The Radio Market," a comprehensive statistical compilation, was announced.

A feature of the meeting was a speech by Representative Clyde Kelly of Pennsylvania, joint author of the "fair trade" bill, which is aimed at "cut-throat competition encouraged by unjustified application of anti-trust laws."

Cullinan Re-elected Chairman of Electrical Wholesalers

George E. Cullinan, vice-president of the Graybar Electric Company, was re-elected chairman of the executive committee of the electrical wholesalers at their twentieth annual convention, held at Hot Springs, Va., last week. A report of the convention, where the name of the association was changed from the Electrical Supply Jobbers' Association to the National Electrical Wholesalers' Association, appeared on page 1260 of last week's ELECTRICAL WORLD. Edwin M. Keatley was elected vice-chairman, succeeding L. T. Milnor of the Milnor Electric Company, Cincinnati. Mr. Keatley is president of the Virginian Electric, Inc., Charleston, W. Va.

Six Thousand to See Artistic Lighting Exhibit

Upward of a million dollars' worth of the most modern of lighting fixtures and accessories were shown at the national lighting equipment exhibition held in connection with the convention of the Artistic Lighting Equipment Association at the Hotel Sherman, Chicago, June 11 to 15. With registration of delegates in excess of two thousand on the second day, indications were that visitors would reach a total of five or six thousand by the end of the week, making this the best attended exhibit yet staged by the association.

Lighting equipment was displayed by 125 or more manufacturers, and the design of fixtures showed many advances and changes in styles both in the finer grades and in moderate-priced lines. A trend toward modern and exotic art was apparent in some styles of wall fixtures and table lamps, while adaptations of period styles and more liberal use of color were much in evidence. Visiting dealers expressed themselves as well pleased with the exhibition, which, being held in the summer, affords ample opportunity to prepare for the busy fall.

During the convention the different manufacturing groups held meetings on Tuesday, Wednesday and Thursday. On Tuesday evening the Chicago sections of the Illuminating Engineering Society and Artistic Lighting Equipment Association held a joint meeting and dinner, at which Prof. H. H. Higbie, past-president of the I.E.S., addressed the meeting on "Practical and Proper School Lighting.

Load Building Uppermost at Pasadena

Pacific Coast Electrical Association Holds a Unique Convention in Southern California City, in Which Playlets, Pictures and Employees' Oratory Play Part

LOAD building was the theme that dominated the twelfth annual convention of the Pacific Coast Electrical Association (geographic division of the N.E.L.A.), held at the Huntington Hotel, Pasadena, Cal., June 12 to 15. President W. L. Frost, in addressing the six hundred delegates, pointed out that the industry has before it the greatest load-building opportunity in its history and said that now the problems of engineering and production have been solved the industry must squarely face its selling problem. He saw little to fear in the investigation of the Federal Trade Commission and said that the industry can confidently stand upon its record, a record of improvement in service, constant reduction in rates and fair dealing with the public.

The convention was unique in that many of the committee reports were presented in "skit" or picture form and the program was dramatized and animated throughout. A three-minute speaking contest held at a luncheon on the first day was of unusual interest. Six young men and women of the industry displayed an unusual grasp of the selling problem in their addresses on the subject "Electricity Is Cheap—Use More of It." A prize of $100 went to the winner in this contest, and the expenses of all to the convention were borne by their employers.

An innovation in convention programs was a contest between the Accounting, Commercial, Engineering, Transportation and Purchasing and Stores sections to see which could make the best demonstration of how it could assist in load building. Able presentations were made by all, some by slides, some by playlets and some by motion pictures, and all were dramatized. A prize of $100 was to be awarded to the winner on the last day of the convention.

At the one meeting of the Engineering Section F. M. Farmer, chief engineer of the Electrical Testing Laboratories, New York, took his audience on an illustrated "word trip" through the testing laboratories and pointed out the value of the co-operative work carried on by the organization, which he said really supplements the laboratories maintained by various manufacturers and utility companies. Irl C. Martin of the Woodward Governor Company described the requirements and functioning of governing equipment.

Wednesday afternoon, at a general session, reports of the public speaking, industrial relations and customer relations committees were presented, and the winning essay in the contest conducted by the customers' relations bureau was presented by the author. Addresses by Ruth E. Creveling, Eloise Davison and Clotilde Grunsky dealt with the very creditable work which the women's committee is doing and the excellent organization which has been built up to conduct this work.

Officers of the association for the ensuing year, elected at the business meeting which opened the convention, are: President, P. M. Downing, Pacific Gas & Electric Company; first vice-president, E. B. Griddle, Southern Sierras Power Company; second vice-president, A. M. Frost, San Joaquin Light & Power Corporation. The convention was to conclude with general sessions on Thursday and Friday.

Federal Trade Commission Enters Texas

Questions Director of Information Bureau Concerning Newspaper and School Activities in That State—Ballinger and Blain Also Testify

TEXAS had its turn when the Federal Trade Commission resumed its investigation of the public utility companies on Tuesday of this week. William C. Grant, director of the Texas Public Service Information Bureau, a newspaper man still retaining a connection with the Associated Press, told of the bureau's activities. He informed the investigators that he had furnished news items, "feature stories" and occasionally editorials for newspapers and admitted that drafts of two or three editorials which he wrote for the Dallas *Times-Herald* had been submitted to executives of Dallas utility companies before publication.

The witness, under questioning from Mr. Healy, the commission's counsel, said that the bureau had prepared a set of four pamphlets dealing with public utilities for school distribution and last year had circulated 20,000 sets, or 80,000 copies. Of the 1,000 high schools in the State of Texas, he said, 350 had made requests for copies of the pamphlets.

Throughout the testimony Mr. Grant asserted that the purpose of the Texas Public Service Information Bureau was to give the people of Texas the facts regarding the public utilities, and he denied that it was "a propaganda organization" unless the commission's counsel saw fit to include as propaganda "about 75 per cent of all that is published in newspapers" on all subjects of business activities.

"Isn't the prime purpose of your committee to put out information against government ownership such as is provided in Muscle Shoals and the Boulder Dam project?" asked Mr. Healy.

"We conceive it to be our duty to give the public the facts," said the witness. "If the public utilities don't give the public the information on these subjects,

the public has no place to get the information."

The information bureau, Mr. Grant said, got about $16,000 to $18,000 annually to spend from the public utility companies of Texas.

On Wednesday C. W. Davis, chairman of the Texas bureau, told about the contacts made by his bureau with Texas colleges. He testified that the Texas Agricultural and Mechanical College was used by the Southwestern association as an agency through which a survey of rural electrification was made by John E. Waggoner. Documents introduced into the record showed that in 1927 the association spent $3,241 for the survey and that in 1928 the survey expenses have amounted to $5,419. Mr. Davis said that the money was paid to the college, which turned the funds over to Mr. Waggoner.

S. J. Ballinger, secretary of the Southwestern Division of the N.E.L.A., said his organization planned to spend $20,000 this year on public relations work. He said that it already had paid the expenses of a meeting of professors called by Dean C. O. Ruggles, formerly of Ohio State University, at New Orleans to discuss utility courses in colleges. He added that the expenses of many professors to this gathering had been paid by the organization.

Hugh M. Blain of New Orleans, director of the Louisiana-Mississippi Committee on Public Utility Information, declared that T. H. Harris, Superintendent of Education for Louisiana, granted him permission on Dec. 13 last to distribute thousands of utility pamphlets to the schools in that state. He added that the pamphlets were welcomed in the schools of Louisiana.

Mr. Healy at this session produced two canceled checks for $2,500 made out to the Fuel, Power and Transportation Educational Foundation of Ohio, which bore the indorsement of that organization and that of S. S. Wyer, who made an unfavorable survey of the Ontario Hydro-Electric Power Commission's system about three years ago. The checks were drawn by the National Electric Light Association. Mr. Healy's object was to try to show that the N.E.L.A. was concerned with financing the survey—a matter previous testimony was thought to have left uncertain.

Santeetlah Plant Almost Ready for Aluminum Company

The Santeetlah hydro-electric plant in North Carolina on the Tennessee border, which will rank with the largest hydro-electric projects in the South, will go into operation soon, officials of the Tallassee Power Company, its builder, announce. Actual construction work was completed and water turned into the dam on Dec. 7, but it has taken the intervening time to fill the reservoir, which covers an area of approximately 3,000 acres with a 100-mile shore line. The dam is 202 ft. high at the highest point and more than 800 ft. long. A system of tunnels and pipe lines, nearly five miles of which is under mountains, has been constructed to carry the waters in a fall of approximately 600 ft. to a power house with two generating units on the south bank of the lake formed by the Cheoh Dam on the Little Tennessee River.

This project will develop 66,000 hp. and is the second unit on the generating system planned by the Aluminum Company of America at Alcoa, Tenn., where the power will be used. That company's power projects will entail an expenditure of $20,000,000 when completed. It is understood that plans are already under way for an expansion of its manufacturing plants at Alcoa in order to utilize the power from the Santeetlah Dam and also from the Calderwood Dam when it is completed next year.

Purchases and Mergers

Control of Rochester Gas & Electric Corporation Passes from New York Central Railroad to Phillips Interests with Mohawk Valley Company

ANNOUNCEMENT was made at New York on Wednesday, June 13, by A. H. Harris, chairman of the executive committee of the New York Central Railroad Company, that that company had concluded negotiations for the sale of its controlling holdings of the stock of the Mohawk Valley Company of Rochester at $75 per share and of its controlling holdings of common stock of the New York State Railways, which owns Rochester and interurban transit lines, at $25. The announcement did not include the name of the purchaser, but subsequent news from the office of the Long Island Lighting Company in New York confirmed a statement made in Rochester that E. L. Phillips, president of the Long Island Lighting Company, and his associates were to be the new owners. The total sale price is figured at $41,758,325.

The Mohawk Valley Company has for its chief subsidiary the Rochester Gas & Electric Corporation. It also controls four smaller companies — the Cooper Electric Corporation and the Hilton Electric, Light, Heat & Power Company, both of Hilton; the Geneseo Gas Light Company, which does a light and power business, and the Mount Morris Illuminating Company. The Rochester Gas & Electric, capitalized at more than $60,000,000 and with 72,000 kw. in steam-electric and 34,000 kw. in hydro-electric equipment, ranks among the chief upstate light and power organizations. Robert M. Searle is the president.

Mr. Phillips announced that the minority stockholders of the acquired companies have the privilege of accepting the same terms as the railroad or of receiving securities in a new company to be formed in exchange for their present holdings. The new company will take over the Mohawk Valley properties and contiguous properties already owned by the Empire Power Company, bringing into a single organization electric and gas properties in New York State having an aggregate value in excess of $150,000,000, among them being the New York Central Electric Corporation, which in turn controls the Empire Gas & Electric Company; the Seneca Power Corporation and the United Gas & Electric Corporation.

Capitalization of the many small utility companies—largely light and power—which, as noted last week, the Pennsylvania Power & Light Company is seeking authority to merge with itself is placed at more than $13,000,000 in the application pending before the Pennsylvania Public Service Commission. The largest of the companies to be acquired if the company's plans are approved, the East Penn Electric, is capitalized at more than $6,500,000, the Panther Valley Electric at $720,000, the Juniata Public Service Company at $300,000, the Hummelstown Water & Power Company at $200,000, the Franklin Township Carbon Electric Company at $110,000, and the Schuylkill Electric Company at $100,000. About ten of the other companies are "paper" concerns. The total price to be paid for the properties was put at $56,000,000 and their value as $63,000,000.

Some weeks ago newspapers announced the purchase by the Georgia Power Company of the Winder (Ga.) municipal electric plant for approximately $300,000, the company to pay part of the price in cash and assume the bonded indebtedness of the city. This announcement was premature, since the arrangement provided that the plan must be submitted to the voters if a certain proportion of them signed a petition to that effect within three weeks after the proposal had been advertised. The time set having expired without such action, the Winder plant is now to be taken over.

The Southern Public Utilities Company has been negotiating with the Town Commissioners of Huntersville, N. C., for the purchase of the electric lighting system, and an election will be held to determine whether or not the town shall sell.

The New York Public Service Commission has authorized the Mohawk-Hudson Power Corporation to acquire control of the common stock of the Cortland County Traction Company, which operates an electrical distributing system.

The Western Light & Power Company is reported to be negotiating for the municipal power plant at Woodward, Okla.

An offer of $90,000 for the Medicine Lodge (Kan.) municipal electric plant has been made to the City Council by the Western Light & Power Company, with headquarters in Salina. The company's offer includes a rate reduction and an agreement to retain and operate the plant on a part-time basis. The Kansas Power Company, Topeka, has entered a proposal for the purchase of the municipal distribution system of Glen Elder, Kan. The city now receives service from that company. The same company's offer to purchase the municipal distribution and street-lighting system of Natoma, Kan., was defeated by a small majority. Negotiations are under way for the sale to the Kansas Power & Light Company, Topeka, of the distribution system of Everest, Kan., supplied with electricity from the Atchison district of the company. Sale of the municipal distribution system of Circleville, Kan., to the Kansas Power & Light is announced. Circleville formerly received its electric service from the municipal plant at Holton.

"Electrical World's" London Letter

Development of Transatlantic Radio Telephony—Engineers and the New Overhead Line Regulations—Grandmotherly Restrictions—To Check Shoddy Wiring

By Bernard C. Holding
Editor of *The Electrician*

London, June 1.

THE penning of this written monthly link between England and the United States of America reminds one of the progress which continues to be made in the development of another, and immeasurably quicker, link—the transatlantic radio-telephone service, the use of which is increasing at a rate so satisfactory that one London hotel with a large American clientèle has spent for its clients nearly $23,000 in nine months on transatlantic calls.

An outstanding event of recent weeks has been the long-awaited issue by the Electricity Commissioners of the new overhead line regulations. The dissatisfaction which has been expressed as to the unnecessary restrictions imposed by the old regulations has been so vocal, and their effect on line construction here has been so obvious to visitors from the United States, that you cannot fail to be aware of the importance which electricity supply authorities in this country attach to this question. Following frequent representations pointing out the unduly conservative requirements contained in the old regulations, hopes were entertained that substantial relief might be forthcoming. Actually, however, the degree of amelioration afforded cannot be regarded as other than slight. For instance, there has been no reduction in the factors of safety, either for supports or for conductors. Despite the fact that reinforced-concrete supports are finding increasing employment in many countries, the new regulations still require a safety factor of three and one-half for these supports. As the figure for iron or steel is two and one-half, it seems that it must be assumed that reinforced concrete is weaker than one of its constituent parts—a proposition that would puzzle a modern Euclid. Another irksome condition is that requiring the use of duplicate insulators to support conductors erected along a public road or canal or within 50 ft. thereof.

As has been seen in the above and in earlier instances, the development of electricity supply in this country is still hedged about with grandmotherly restrictions, and nowhere is this more obvious than in connection with the obtainment of rights-of-way for overhead lines. Matters have indeed become so bad that the Overhead Lines Association has held a special meeting to discuss the possibility of obtaining a standardized form of agreement. As the result of this discussion some concrete—not reinforced—proposals will probably be offered to the Electricity Commissioners.

The opinion that the new regulations will not afford a great deal of relief to electricity supply authorities is fairly general, though some engineers, including Borlase Matthews, president of the Overhead Lines Association, have recently stated that the new rules will permit a reduction of from 12 to 30 per cent in the cost of these lines.

Engineers concerned are also keenly feeling the need of some standard of overhead erection practice and materials. There is at present no definite ruling as to the spacing of conductors relative to sag. Then there are various devices for earthing fallen wires on low-tension lines, all with their individual good points—but no standard. Other directions in which the need for standardization is felt include types of poles and the sizes of stay wires and stay blocks. With regard to reinforced-concrete supports, it is understood that the Electricity Commissioners are continuing their consideration of the possibilities of this material, as the result of which it is hoped there will be some modification of the ridiculous factor of safety which is now applied to this form of construction.

The National Register of Electrical Installation Contractors—an independent professional authority which exists to protect the public from shoddy wiring, by registering contractors who can produce satisfactory evidence of experience and ability—recently held its third annual meeting, when it was disclosed that 1,066 electrical contractors are now enrolled. The Register is being much discussed in contracting circles, it being felt that the existence of a large number of shoddy wiring installations affords a strong reason for making the existing voluntary registration scheme into a compulsory one. With one section of the industry clamoring for the removal of restrictions and another fervently demanding restrictive ordinances, we have a curiously contrasted picture. At present there seems little likelihood that either will receive full satisfaction.

A young body which, except indirectly, is less fettered by regulations is the Electrical Association for Women. It is, I believe, the first organization of its kind in the world and in its three years of existence has attracted a membership of two thousand, divided among eight branches. Under the directorship of Miss Caroline Haslett, it has done excellent work. Its new president is Mrs. Wilfrid Ashley, the wife of the Minister of Transport.

An educative force which functions within the electrical industry and which has already achieved remarkable success is the E.L.M.A. Lighting Service Bureau in London, which recently gave the seventeenth of its special illumination design courses. These are open to any member of the industry, and the lectures and demonstrations are held in premises completely equipped with experimental apparatus and a full range of modern lighting equipment.

Rebuilding San Francisquito Power House

ONE of the two 17,500-kva. generators which were running when the St. Francis Dam in the San Francisquito Canyon, California, gave way on March 12 was damaged beyond repair. The other will be placed in operation after thorough cleaning and drying and reconstruction of the power house. Operations to this end are now in full blast, and the city of Los Angeles, owner of the plant, expects to have the unit in operation in June. A new unit has been ordered and will, it is expected, go into service by November. Enforced idleness of the plant is reported to be costing the city $2,000 a day.

President-Elect Arkwright on Power Investigation

He Calls for Constructive Criticism Based on Facts Concerning the Conduct of the Electrical Industry and on the Dissipation of Prejudice.

IN A PRESS interview at Atlantic City just after the adjournment of the National Electric Light Association convention, the president-elect, Preston S. Arkwright, talked of the investigation into the light and power industry now in progress under the direction of the Federal Trade Commission.

"We welcome an opportunity to get the facts about the conduct of our business before the public," Mr. Arkwright said. "We shall be grateful if the Federal Trade Commission permits to be brought out the facts showing what we have done, what we are doing and what we hope to do.

"Our industry has felt for many years that a continuation of its success in expanding its service to wider and wider areas, from city to town, to hamlet, to farm, and in improving its service to existing customers and in making more economical its cost, depends upon public understanding of the industry. Prejudice is born of ignorance and will disappear when the facts and economic principles governing the industry are understood. A knowledge of the truth by the people will confuse the demagogues. If the industry is unjustly burdened, if it is subjected to repressive or unduly restrictive regulation, if it is constantly menaced with confiscation through government competition with limitless power of taxation to support uneconomic operation, it will of necessity be unable to perform this duty. The service will grow poorer, the territory of its usefulness will be narrowed, further beneficial applications of the service curtailed, its costs will grow higher, and while the industry will suffer loss, of course, the injury to the public in lessened helpfulness and in greater cost will be immeasurable.

"Knowing the facts and the detrimental consequences to the public of acts which result from a lack of understanding, the industry would fail in the trust reposed in it if it should neglect to employ every fair means to offset misrepresentations by knowledge. Constructive criticism would be helpful to it. Mere abuse or effort to create prejudice will accomplish harm alone. We trust that the criticism, if any is leveled at us, may be of a constructive character, capable of producing results that would be helpful."

Canadian Convention Will Sail up the Saguenay

Sailing from Montreal on Wednesday morning, June 20, the steamship *St. Lawrence* will be the theater of the 1928 convention of the Canadian Electrical Association, which is affiliated with the National Electric Light Association, functioning as a geographic division. A stop will be made on Thursday at Port Alfred, where a motor trip of inspection will be made. The delegates will visit Arvida, Chute á Caron, Riverbend, Ile Maligne and other places which are the sites of large hydro-electric installations and projects. On Friday afternoon the boat will reach Murray Bay, where the annual banquet will be held at the Manoir Richelieu. The tour will end when Montreal is again reached on Saturday afternoon.

Besides the usual committee reports, there will be a paper on "The Economics of Supervisory Control Systems" by R. J. Wensley, Westinghouse company, and one on "High-Voltage Power Transmission" by H. H. Dewey, General Electric Company. Dancing on the boat and sports on land will provide amusement.

Oregon Municipal-Plant Case Arouses Interest

In recognition of the national importance attached to litigation involving the jurisdiction of municipalities operating their own utilities outside of corporate limits, the Oregon Supreme Court has advanced on the docket for hearing the suit of the Yamhill Electric Company, respondent, vs. the City of McMinnville et al., appellants. This is a suit in equity brought by the private company to enjoin the city from constructing and operating a power line entirely outside and beyond the corporate limits and delivering energy over it to private consumers until the city shall have procured from the Public Service Commission a certificate of convenience and necessity. The lower court sustained the utility company and issued a restraining order. The city of Eugene, which also owns a municipal plant, has intervened, maintaining that to hold that all except corporate business belongs by law to private utility companies is to make the law discriminatory and hence unconstitutional.

When the Supreme Court renders its decision the authority of blanket-franchise privileges in Oregon will also be finally decided, one of the main points at issue affecting the jurisdiction of a county court in granting these franchises. The Yamhill company contends that the municipal utility is attempting to ignore such a franchise owned by its antagonist.

In the event of the decision affirming the findings of the lower court, it will be mandatory on the part of the regulatory commission to order that all municipalities owning and operating utilities outside of city limits comply with the law requiring public service corporations to file annual reports, adhere to the uniform accounting rules, remit gross income taxes and otherwise submit to regulation by the commission in matters of rates, charges and practices affecting those portions of lines and service beyond corporate boundaries. Another effect will be that a certificate of convenience and necessity will have to be obtained before any extension of a municipal plant outside city limits can be made.

S.P.E.E. Meets at Chapel Hill on June 26-29

A four-day program has been arranged for the thirty-sixth annual meeting of the Society for the Promotion of Engineering Education, which will be held at the University of North Carolina, Chapel Hill, N. C., on June 26-29. President R. L. Sackett will preside at the opening session on Tuesday, when President H. W. Chase of the University of North Carolina will welcome the delegates. Herbert Schofield, principal of Loughborough College, England, will address this session on "A Productive Industrial Plant on College Premises," and there will be committee reports in the morning and teaching conferences in the afternoon. Other conferences will be held on subsequent afternoons.

On Wednesday R. I. Rees, American Telephone & Telegraph Company, will speak on "College Experience in Its Relation to Achievement in Industry"; Dr. C. F. Scott and W. E. Wickenden, director of investigations, will report for the board of investigation and coordination, and the annual dinner will be held in the evening. On Thursday Dean Sackett will make his official address, taking as his subject "The Changing Emphasis in Engineering Education,'" Governor A. M. McLean will speak, Prof. J. B. Davidson of Iowa State College will discuss agricultural engineering, and there will be a barbecue in the evening at the Cape Fear plant of the Carolina Power & Light Company. H. P. Hammond, associate director of investigations, will talk on "A Practical Step Toward Improving Methods of Teaching" on Friday morning.

Dissatisfaction Expressed as to New St. Louis Rates

City Counselor Muench of St. Louis, in a statement filed with the Missouri Public Service Commission, contends that the Union Electric Light & Power Company should reduce its rates at least $1,418,000 instead of the voluntary cut of $706,467 provided in the schedules that became effective on June 1. The city authorities, for whom Mr. Muench speaks, ask that the commissioners make a complete investigation and audit of the Union Electric's books and records as well as an investigation of the operations of the company. They contend that a proper adjustment of the company's depreciation account would permit a total reduction of $2,000,000 in annual revenue and that even with so drastic a decrease the company could still earn 7 per cent return on its claimed valuation.

"The proposed rates offer no reduc-

tion to the small or domestic consumer in St. Louis, and in this respect, too, we believe that the schedule is unreasonable and unjust," Counselor Muench declares. He maintains that while the Union company claimed $1,698,164 for depreciation in 1926 and $2,336,400 in 1927, in reality it has never expended more than $429,616 over a period of eleven years for maintenance of its properties. The city contends that not more than $950,000 should be charged off for depreciation. In eleven years the company's depreciation reserve increased from $989,726 to $9,663,001 in 1927.

The Public Service Commission in an order issued on June 6 asked the Union company to answer or satisfy the city's demands for a general reduction in electric rates within ten days. The company will oppose the additional cut.

Saranac Program for International Lighting Congress

After a tour of cities in the northeastern part of the United States and attendance at the Toronto convention of the Illuminating Engineering Society on Sept. 17 to 20, the delegates from foreign countries to the coming International Illumination Congress, together with American members, will, as previously announced, assemble at the Saranac Inn, Saranac Lake, N. Y., for their first world congress, to be held in connection with the plenary meeting of the International Commission on Illumination. The Saranac sessions will last from Sept. 22 to Sept. 28 inclusive, and a preliminary program has been drafted as follows:

A. Sessions under auspices of international technical committees: Automobile headlighting, C. H. Sharp, United States, chairman; daylight illumination, secretariat, Great Britain; factory and school lighting, L. B. Marks, United States, chairman; research on glare, secretariat, Italy; street lighting, W. Wissmann, Germany, chairman.

B. Open committee meetings, for discussion of other topics assigned to international technical committees; subjects to be announced later.

C. International symposia, arranged by program committee: Residence lighting practice, show-window lighting practice, lighting for aviation, status of lighting education.

D. Papers by leading authorities sponsored by national committees, including both scientific and practical subjects of outstanding interest in fields not covered by technical committees; subjects to be announced later.

The tour of inspection for the foreign visitors will begin at New York, where they are expected to meet about Sept. 5. Outstanding lighting installations and the important laboratories and manufacturing establishments devoted to illumination in the metropolitan area will be the first objectives. The visitors will then journey by special train to Philadelphia, Washington, Boston, Cleveland, Detroit, Chicago, Niagara Falls and Toronto. Opportunity will be extended to Americans desiring to accompany the foreign delegates on the tour. Reservations and plans are being handled by G. S. Merrill, chairman tour committee, Nela Park, Cleveland, Ohio.

Briefer News

INCREASE OF GENERATING CAPACITY AT SAN BENITO.—The power plant of the Central Power & Light Company at San Benito, Tex., is to be enlarged by the installation of a 10,000-kw. turbo-generator. The unit will almost double the capacity of the plant, which is now approximately 13,000 kw.

NEW YORK ELECTRICAL SOCIETY ELECTS OFFICERS.—The annual meeting of the New York Electrical Society for the election of officers was held on Tuesday, June 12, when the following were elected: President, E. E. Dorting, Interborough Rapid Transit Company; vice-presidents, A. K. Baylor, E. B. Meginniss and H. H. Sheldon; treasurer, E. B. Meginniss (re-elected); secretary, H. E. Farrer, (re-elected). R. B. Grove, H. Rentschler and W. T. Teague remain as vice-presidents for one year.

NORTHERN MARYLAND POWER COMPANY WAS SOLD FOR $821,275.—The purchase price of the property of the Northern Maryland Power Company in Havre de Grace, Aberdeen and vicinity, recently bought from the Philadelphia Electric Company by the Consolidated Gas, Electric Light & Power Company of Baltimore, has been revealed as $821,275 in the petition filed with the Maryland Public Service Commission seeking approval of the transaction. The commission set June 26 as the date for hearing.

STEAM PLANT TO AID HYDRO STATIONS IN BRITISH COLUMBIA.—A contract has been let by the British Columbia Electric Railway Company for the construction of a steam plant for the generation of electrical energy on Burrard Inlet. It will cost $2,500,000 and will serve as an emergency source of supply in case of interruption of service from any of the hydro-electric plants normally used. It will be the first unit of what is to be known as the Hastings plant of the company.

KENTUCKY UTILITIES COMPANY'S NEW CONSTRUCTION PROGRAM.—A new program of construction and expansion has been developed by the Kentucky Utilities Company since May 1 which when completed will have entailed an outlay of about $150,000. It includes an outdoor high-tension switching station at Pocket, Va., and the building of new transmission and distribution lines in various parts of the company's territory, as well as the installation of additional apparatus.

PLANS FOR ELECTRAGISTS' CONVENTION.—Arrangements for the 1928 convention of the Association of Electragists International, at the Stevens Hotel in Chicago, Aug. 6 to 10, are going forward rapidly. The preliminary program includes addresses by Philip Cabot, School of Business Administration, Harvard; E. O. Shreve, General Electric Company; L. K. Comstock, National Councilor United States Chamber of Commerce; John F. Gilchrist, vice-president Commonwealth Edison Company; Victor Tousley, National Fire Protection Association, and others with pertinent messages for the members.

"WHITE WAYS" FOR RURAL ROADS.—First-hand information on what highway lighting of the future may be was imparted to one hundred county supervisors, city and town officials and engineers recently at an inspection of 7.3 miles of rural highway "white way" installed as a demonstration unit by the Rochester Gas & Electric Corporation. The "white way" link connects East Bloomfield and Canandaigua, N. Y.

LOWER RATES IN NORTH DAKOTA.—The North Dakota State Railroad Board has approved new combination electric rates filed by the Montana-Dakota Power Company and applicable to homes where electricity is used for lighting, refrigeration and cooking; also new rates for commercial refrigeration and cooking purposes applicable to hotels and restaurants. The former will affect 46 North Dakota towns served by the company and the latter 39 towns.

REPAIRING FLOOD DAMAGE AT ST. JOHNSBURY, VT.—The Twin State Gas & Electric Company is rebuilding the power plant above St. Johnsbury Center, Vt., which was destroyed in the November flood. An automatically operated station of 200 kw. rating, the first of its kind in the section, will be built. Another automatic station is planned on the Passumpsic River above Arlington Bridge, and the St. Johnsbury dam which went out with flood will be rebuilt. Construction cost is estimated at $150,000.

TWO CALIFORNIA UTILITIES REDUCE RATES.—The Vallejo Electric Light & Power Company and the Coast Counties Gas & Electric Company have been authorized by the California Railroad Commission to place in effect reduced rates applicable to commercial and domestic lighting. In the case of the Vallejo company the new rate will save customers approximately $25,000 a year, and on the lines of the Coast Counties company about 15,000 customers will benefit from an annual reduction of $70,000.

NEW POWER CONTRACT BETWEEN HARTFORD LIGHT AND POWER RAILWAY UTILITIES.—The Hartford (Conn.) Electric Light Company has entered into contract with the Connecticut Company, a traction utility, whereby the latter will purchase additional power from the former. The Connecticut Company will maintain the Commerce Street power plant and the Hartford company will install new equipment. At the present time the Hartford Electric Light Company is furnishing 1,500 kw. to the

traction concern. It will add $200,000 worth of equipment to bring the energy furnished up to 6,500 kw. The contract will become operative as soon as the new equipment is installed.

RATE REDUCTIONS IN EASTERN IDAHO FOR STREET LIGHTING. — The Oregon Public Service Commission has ordered reductions ranging from 5 per cent to 20 per cent in rates for incandescent street lighting in all municipalities in eastern Oregon served by the Idaho Power Company. The new schedule became effective June 1.

NEW YORK EDISON RATE CASE ADJOURNED UNTIL FALL. — At another hearing held last week by Public Service Commissioner William R. Pooley on the five-year-old complaint filed by John F. Hylan as Mayor against the rates charged by the New York Edison Company the only witness was Henry Brady, who testified concerning values of the real estate owned by the company. The city's valuation was $9,042,000, the company's $11,168,000. The hearing was adjourned until Sept. 15.

NORWALK, OHIO, SEEKS EJECTMENT OF POWER COMPANY.—The Court of Appeals of Toledo has ordered the Ohio Electric Power Company of Oberlin, a Middle West Utilities subsidiary, to cease operations at Norwalk, Ohio, by Sept. 1. The company has been operating for two years in competition with the municipal power plant, and the city about a year ago sought to eject it on the ground that it had no franchise. The Norwalk municipal plant is rated at 2,000 kva. It is believed here that the Ohio Electric Power Company will appeal to the State Supreme Court.

SOUTH CAROLINA CITY CLAIMS AN ELECTRICAL RECORD.—The little city of Chester, S. C., with less than ten thousand population, is the most completely electrified city in America, if one takes into consideration the number of homes equipped with electric ranges, according to John Paul Lucas, vice-president of the Southern Public Utilities Company of Charlotte, N. C. Two out of three of the white customers of the Southern Public Utilities Company in Chester are using electric ranges in their homes. It is little more than ten years ago since the first one was sold there.

NOVA SCOTIA'S NEW HYDRO ENTERPRISE.—The projected newsprint industry on the Mersey River, Nova Scotia, reported a few weeks ago, will lead the provincial government to undertake three separate power developments, at Upper Lake Falls, Lower Lake Falls and Big Lake Falls. The Lower Great Brook Falls site will still be available, as well as further capacity at "the Guzzle," where the Liverpool plant is situated, these providing for further ultimate development of 6,200 hp. It is expected that the three developments first named will be ready to deliver power by Oct. 1, 1929. The initial 20,000-hp. undertaking calls for the delivery of 105,000,000 kw.-hr. annually. The capital cost is estimated at $3,659,000. The power will be supplied to the company at cost, put at approximately $20 a horsepower, for a period of 40 years.

CENTRALIA, WASH., PLANS MUNICIPAL PLANT.—As a preliminary to embarking on a municipal power project entailing an estimated expenditure of $300,000, the Mayor and City Commissioners of Centralia, Wash., have filed water right application at Olympia to take 25 sec.-ft. from the Skookumchuck River in Thurston County. The plan would require construction of a 24-mile pipe line, which would provide power for the electric plant and give the city added water supply. At present the city gets its electric energy from the Western Cross Arm & Manufacturing Company, using its own distributing system. It is planned to begin work on the project by Sept. 1.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see ELECTRICAL WORLD for Jan. 7, page 80.]

Northwest Division, N.E.L.A.—Portland, Ore., June 19-22. B. Snow, 1208 Spalding Bldg., Portland, Ore.

American Society of Agricultural Engineers—Rural electric session, Hamilton Hotel, Washington, June 19-22. Raymond Olney, St. Joseph, Mich.

Canadian Electrical Association—SS. "Richelieu" from Montreal to Saguenay and return, June 20-23. H. M. Lyster, 712 Power Bldg., Montreal.

American Institute of Electrical Engineers—Cosmopolitan Hotel, Denver, June 25-29; Pacific Coast convention, Spokane, Wash., Aug. 28-31. F. L. Hutchinson, 33 West 39th St., New York.

Association of Iron and Steel Electrical Engineers—Hotel Stevens, Chicago, June 25-28. J. F. Kelly, Empire Bldg., Pittsburgh.

American Society for Testing Materials — Chalfonte-Haddon Hall, Atlantic City, N. J., June 25-29. C. L. Warwick, 1315 Spruce Street, Philadelphia.

Society for the Promotion of Engineering Education—University of North Carolina, Chapel Hill, N. C., June 26-29. F. L. Bishop, University of Pittsburgh, Pittsburgh.

Empire State Gas and Electric Association—Commercial Section, Hotel Utica, Utica, N. Y., June 28 and 29. C. H. B. Chapin, Grand Central Terminal, New York.

Public Utilities Advertising Association —Detroit, July 8-12. T. P. Pfeiffer, Byllesby Engineering & Management Corp., Chicago.

East Central Division, N.E.L.A.—Cedar Point, Ohio, July 10-13. D. L. Gaskill, Greenville, Ohio.

National Electric Credit Association—Boston, July 16 and 17. F. P. Vose, 1008 Marquette Bldg., Chicago.

Wisconsin Utilities Association, Electric Section—Appleton, Wis., July 26 and 27. J. N. Cadby, 432 Broadway, Milwaukee.

National Electrical Manufacturers' Association — Policies Division, Association Island, Henderson Harbor, N. Y., July 29-Aug. 1. S. N. Clarkson, 420 Lexington Avenue, New York.

Camp Co-operation VIII—Association Island, Henderson Harbor, N. Y., Aug. 2-7. Society for Electrical Development, 420 Lexington Avenue, New York.

Association of Electragists International—Hotel Stevens, Chicago, Aug. 6-11. L. W. Davis, 15 West 37th St., New York.

ALBERT LEA, MINN., AND OSAGE, IOWA, TO BE JOINED BY 60,000-VOLT LINE.—The Central States Power & Light Company, with headquarters at Dubuque, Iowa, expects soon to begin the construction of a transmission line between Osage, Iowa, and Albert Lea, Minn., a distance of about 50 miles. It will cost $3,500 a mile and will carry a maximum load of 66,000 volts.

NATIONAL COMMISSIONERS' ASSOCIATION WILL MEET AT NEW ORLEANS IN NOVEMBER.—The place first selected for holding the 1928 convention of the National Association of Railroad and Utilities Commissioners has, as the result of a referendum, been changed from Glacier National Park, Mont., to New Orleans. The opening date of the convention has also been changed from Sept. 10 to Nov. 13. The reason for the change was the desire to wait until the presidential election was over and the fact that the climate of the Montana resort would be inclement at the later date.

ROCKY MOUNT (N. C.) MUNICIPAL PLANT FOUND INADEQUATE. — Rocky Mount, N. C., which finds its municipal electric plant inadequate, has engaged an electrical engineer to make a survey of the situation and transmit recommendations to the Board of Aldermen. Three solutions have been suggested—the addition of another unit to the power plant, connection with the Rocky Mount mills, which generate their own power, and interconnection with the privately owned transmission line already built. Aldermen desired to add a unit to the present plant at a cost of $90,000, but strong opposition has arisen.

WISCONSIN ACCOUNTANTS WILL MEET.—The Accounting Section convention of the Wisconsin Utilities Association, to be held in Milwaukee, June 21-22, promises some interesting discussion. A certified public accountant will give his professional view of public ownership, the chairman of the Wisconsin Railroad Commission will discuss state versus national control and regulation of utilities, and the auditor of the Wisconsin Power & Light Company, which is a leader in rural electrification, will talk on cost accounting as involved in the operation and maintenance of farm-line extensions.

UNDERGROUND TRANSMISSION AGITATED FOR CINCINNATI SUBDIVISIONS.—Members of Cincinnati's city planning commission, in session June 4, were told by the Union Gas & Electric Company that underground installation of all service wires in subdivisions of the city, as proposed in a special order pending before the commission, would cost five times as much as overhead construction. As this would be the

opening of a campaign to extend this method throughout the city, it would result in doubling the present cost of service. The company expressed willingness to proceed with the improvement in a gradual manner.

ITINERARY OF THE 1928 INTERNATIONAL "POWER TOUR."—The Midwest Power Conference announces the following program for the "power tour" to Europe arranged by it: Aug. 18, sail from New York; Aug. 26-28, Glasgow; Aug. 29, Newcastle; Aug. 30, Manchester; Aug. 31, Rugby; Sept. 1-4, London; Sept. 5-6, Cologne; Sept. 7-9, Berlin; Sept. 10-11, Leipzig; Sept. 12, Zurich; Sept. 13, Zurich and Baden; Sept. 14-15, Milan; Sept. 16-17, Milan or Turin; Sept. 18-21, Paris; Sept. 22, sail for New York. The New York City offices of the Midwest Power Conference, 25 Broadway, may be addressed for reservations.

UTAH COPPER COMPANY TO EXTEND ELECTRIFICATION.—Complete electrification of the Bingham (Utah) mining properties of the Utah Copper Company, involving a minimum of 20 electric locomotives and a maximum of approximately 40, has been announced by that company. Although the actual mining operations are already electrified, utilizing electric shovels, the haulage system of the property has up to the present been of the steam type. When completed, the project will, it is said, be the largest electrified metal mine in the world and will involve the largest number of electric locomotives ever applied to an open-cut mining operation. The decision to change over from steam to electric haulage, electrifying the entire project, follows a test of about a year with a trial installation of a 75-ton combination storage battery, trolley and cable-reel locomotive built by the General Electric Company.

IRON AND STEEL ELECTRICAL ENGINEERS TO GO TO CHICAGO.—In connection with its annual exposition the Association of Iron and Steel Electrical Engineers will hold technical sessions at the Hotel Stevens, Chicago, on June 25 to 28, when reports and papers will be presented on electric heat, electrical developments, electric welding, standardization, high-tension practices, motor-driven rollers, selection of motors for main drives of strip and skelp mills, selection of motors for main drives of merchant, bar and rod mills, insulation of open-hearth checkers, boiler pressures above 350 lb., factors governing the purchase of coal, anti-friction bearings for roll necks, anti-friction bearings for motors and anti-friction bearings for auxiliaries. There will be a conference on fuel savings.

THE PROPOSED VALUATION OF THE PORTLAND (ORE.) COMPANIES.—Departing from the usual procedure, the Oregon Public Service Commission officially invited customers concerned to present to it on June 14 their views concerning the mode of action to be adopted in connection with the pending examination of the rates and valuation of the Portland Electric Power Company and the Northwestern Electric Company. The investigation involves the establishment of a rate schedule for residential lighting and cooking and commercial lighting in districts served by the two utilities outside of the metropolis only. The commission desires to be guided as to whether it shall undertake to establish entirely new valuations or shall use the valuations found as of Dec. 13, 1916, based on 1914 prices, and, if the latter, whether the valuation of 1916 shall be treated merely as evidence of the extent and value of the property at that time.

Commission Rulings

DISTRIBUTING COMPANY MAY INCLUDE IN RATE BASE THE VALUE OF LINE ADVANTAGEOUSLY LEASED BY IT.—Dismissing a complaint of alleged excessive rates brought against the La Jara Electric Company, the Colorado Public Utilities Commission discussed an objection raised to the inclusion in the rate base of the value of a transmission line owned by the company but leased by it to the Colorado Power Company, from which the La Jara company purchased energy for distribution. The commission pointed out that the arrangement was a financially advantageous one and said: "If the defendant had not entered into this contract, it could hardly be contended that the value of the line should not be included in its entirety in the rate base. It is, therefore, difficult to conclude that after the defendant has entered into a contract saving the consumers $587 per year the value of the said line should in large part be eliminated from the rate base."

GROWTH OF BUSINESS WITH REDUCED RATES WILL OFFSET PART OF APPARENT LOSS.—The fact that in a prosperous community the natural growth of business will be accelerated by the reduction of rates was dwelt upon by the Massachusetts Department of Public Utilities in its order, previously reported in the ELECTRICAL WORLD, reducing the maximum price of the Cambridge Electric Light Company from 8 to 5½ cents a kilowatt-hour. The department said: "On the basis of the consumption in 1926 this would mean a reduction on all electricity sold for domestic and commercial purposes of a maximum of $318,805 and, in our opinion, would be considerably less. Such a reduction would leave as a net amount available for dividends, after setting aside the same depreciation as in 1926, the sum of at least $345,000. It is clear, however, that the actual reduction would be less than the amount above stated. Experience has demonstrated that a reduction of rates charged for electricity will effect a substantially increased use for domestic and commercial purposes, resulting in increased gross income without corresponding increases in expense. In addition, the reduction in income will result in decreased taxes. Both of these factors will operate to make an actual reduction in income considerably less than the maximum amount stated."

Recent Court Decisions

INDIANA ACT ALLOWING APPEAL TO COURTS FROM COMMISSION DECISIONS DECLARED UNCONSTITUTIONAL.—A ruling affecting public utility patrons of Indiana and utilities themselves, made in the Circuit Court at Frankfort, has declared unconstitutional the 1927 statute permitting individuals, corporations and municipalities adversely affected by orders of the Indiana Public Service Commission to appeal to circuit and superior courts. The ruling was in an appeal taken by telephone patrons at Kirklin, Ind., from a commission order granting rate increases to the company in that town. The court held the statute unconstitutional on the ground that the law delegated a duty to the court which it was not empowered to fulfill. The statute was one of the so-called remedial measures passed by the last Legislature. Harvey Harmon, a member of the Public Service Commission, had declared it to be a disastrous piece of legislation which virtually vitiated the commission's powers of regulation.

COMMISSION DECISION ON VALUATION PRESUMPTIVELY CORRECT.—In the decision of the United States District Court in Massachusetts vacating the restraining order granted to enjoin the Department of Public Utilities from enforcing its rate decision in the case of the Cambridge Electric Light Company (ELECTRICAL WORLD, April 14, page 776) the chief argument for upholding the decision pending the report of a special master was phrased as follows: "The parties are in disagreement as to the value of the property, the legal rate of return and the amount of net return which the new rate will produce. Upon the first point we are asked to accept for present purposes the valuation of the company's expert and officers against that of the department made after hearing the same expert and presumably the same officers. This ought not to be done unless we are satisfied that the department valuation, which carries a presumption of correctness, is based upon some fundamental error of fact or of law. The plaintiff contends that the department has proceeded upon the Massachusetts theory of valuation in disregard of the principles established by the United States Supreme Court. In the case of the Worcester Electric Light Company the court evidently so viewed the findings of the department, and the injunction was granted. In the present case, which was decided by the department after the Worcester case had been decided by the court, the department explicitly states that its valuation has been arrived at under the rules of the United States Supreme Court. There is nothing in the record which warrants us in ignoring or disregarding this statement. The value found is a fact, in determining which the department declined to accept the evidence of value now submitted to us by the plaintiff. We are not dealing with the case on full proofs, but only in a preliminary way and on the evidence as it stands. No sufficient reason is shown for rejecting the decision of the department, which is presumptively correct, in favor of affidavits submitted by the plaintiff, largely from the same witnesses whose testimony *in extenso* was regarded as unconvincing by the commissioners."

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

News About Men of the Industry

P. S. Arkwright New President of N.E.L.A.

Preston S. Arkwright, who was elected president of the National Electric Light Association at the convention held last week in Atlantic City, has been nationally prominent in electrical circles for a number of years. Following graduation from the University of Georgia law school in 1891 with the degree of LL.B., Mr. Arkwright practiced law in Atlanta for about a decade before entering the public utility field. To the electrical industry he brought brilliant legal attainments, coupled with sound executive ability, which enabled him to build up a consolidated system in

P. S. Arkwright

Atlanta out of a troubled and disorganized situation. This achievement, perhaps more than any of his other accomplishments, attracted the attention of the light and power executives throughout the country and it was not long before he was recognized as one of the industry's energetic leaders, famous for his ability to establish good public relations.

When Mr. Arkwright became president of the Georgia Railway & Power Company, successor to the Georgia Railway & Electric Company, in 1912, hydro-electric power development was practically unknown in the South. During his presidency the company has acquired the Bull Sluice development and harnessed the waters of the Tallulah and Tugalo Rivers, one of the biggest hydro-electric projects undertaken in the southern part of the country. Mr. Arkwright has been chairman of the civic development committee of the N.E.L.A. during the past year and by virtue of his election to the presidency becomes chairman of the Charles A. Coffin prize committee.

ROY A. HUNT has been elected president of the Aluminum Company of America to succeed Arthur V. Davis, who has been made chairman of the board. Mr. Hunt has been a vice-president and director. Edward K. Davis has resigned as a vice-president and director of the company and has been elected president of Aluminum, Ltd.

SAMUEL INSULL, JR., arrived in New York aboard the Cunard liner *Mauretania* June 8 after a short sojourn abroad.

EDWARD N. HURLEY, chairman of the executive committee of the Electric Household Utilities Corporation, returned from abroad June 11 on the *Leviathan* of the United States Lines after a sojourn in Europe.

FREDERICK A. SCHEFFLER, special representative of the Fuller Lehigh Company, New York, is at the present time touring Europe. His itinerary includes Lisbon, Naples, Rome, Florence, Venice, Paris and London. Mr. Scheffler will return to New York about July 10.

C. A. KITTREDGE, who has been connected with the distribution department of the Alabama Power Company, has been transferred to Gadsden in the capacity of district manager. Mr. Kittredge was formerly identified with the company's southern division for several years as superintendent.

JOHN W. SHEEHEY, for the past ten years superintendent of distribution of the Burlington (Vt.) Light & Power Company, has been appointed manager of the company on behalf of the Peoples Light & Power Company, which lately acquired it from the United Gas Improvement Company. He succeeds D. W. Jardine, who has been transferred to the Philadelphia offices of the U.G.I. organization.

O. J. MILLER, for the past five years superintendent of production for the Tennessee Electric Power Company, has been appointed manager of the production and transmission departments of the company, in which capacity he will be responsible for the operation of all of the company's power stations and the construction and operation of the transmission lines throughout the territory served by the company in middle and east Tennessee. A native of Ohio and a graduate of Ohio State University, Mr. Miller first entered the employ of E. W. Clark & Company Management Corporation at Columbus, Ohio, working on various civil and mechanical matters in connection with the operation of public utility properties. In 1920 he removed to Chattanooga with the Tennessee Power Company on various problems of operation and construction and in 1923 he was appointed superintendent of the production department of the company, in which capacity he had active charge of power generating equipment at all of the company's plants.

H. B. Crouse Elected President of N.E.M.A.

Huntington B. Crouse, president of the Crouse-Hinds Company, Solvay, N. Y., was elected president of the National Electrical Manufacturers' Association at the convention held during the past week in Hot Springs, Va. For many years Mr. Crouse has held a position of prominence in the electrical industry not only as a manufacturer of a product of unusual quality but also as a counselor to the industry and its representative associations.

A native of Fayetteville, N. Y., Mr. Crouse became identified with the electrical business immediately follow-

H. B. Crouse

ing graduation from Andover. He entered the organization already established by his father for the manufacture of panels and switches, the business which later became the Crouse-Hinds Company. Advancing consistently, he came into control in 1905. During his tenure of office the organization attained an enviable position and reputation in the industry and he himself a position of acknowledged leadership.

In spite of the time and energy which Mr. Crouse devoted to the upbuilding of the Crouse-Hinds Company he has shown a marked interest in the representative associations of the industry. At the present time he is a member of the board of governors of the N.E.M.A. and of its executive and policy committee, in addition to being chairman of the finance committee and a member of the business policies committee and the labor committee. He is a past-president of the Associated Manufacturers of Electrical Supplies and has been a stanch supporter of the National Electrical Code.

R. J. RUSSELL, vice-president and a director of the Century Electric Company, has been elected president of the St. Louis Electrical Board of Trade. Mr. Russell is a prominent figure in

electrical manufacturing circles, being also a member of the board of the National Electrical Manufacturers' Association.

F. G. Hamilton Receives New Appointment

Fred G. Hamilton has been appointed manager of operations for the Southern California Edison Company. Mr. Hamilton has had 30 years of service with the Edison company and its predecessor organizations. Beginning in 1899 as a lineman for the Mount Whitney Power Company in Visalia, he has continuously advanced through the various ranks until at the time of the consolidation of the Mount Whitney and Edison companies, in 1917, he was made division superintendent of the San Joaquin Valley district. In 1924 he was transferred to the general office of the Edison Company of Los Angeles as general superintendent of distribution, which put him in charge of all distribution and transmission systems and substation operation. In 1925 he was made assistant manager of operations, which position he held until his recent appointment as head of the operating department.

PROF. A. G. CHRISTIE of Johns Hopkins University sailed for England on the *Mauretania* June 13 to be engaged in consulting engineering work during the summer with some British interests.

N. B. HINSON, who since 1922 has been system-planning engineer for the Southern California Edison Company, has been appointed assistant manager of operation. Mr. Hinson has had 22 years of electrical experience, all of which has been with the Southern California Edison Company, having entered the employ of that company immediately after leaving school in 1906. He spent the first few years in the test department of the company in various capacities. In 1912 he was transferred to the general office as assistant distribution engineer. In 1914 he was appointed distribution engineer and in 1919 he was promoted to be assistant superintendent of distribution. In 1922 he became system planning engineer, in which capacity he determined the needs for service and decided upon locations of substations, transmission lines and general system layouts.

EDWARD B. MEYER, chief engineer of the Public Service Production Company, Newark, N. J., was the guest of honor at a testimonial dinner given May 31 in commemoration of his quarter century connection with Public Service companies. The dinner was given at the Washington Restaurant, Newark, with about sixty friends and associates in attendance. A silver platter, a loving cup and a scroll containing the signatures of those present were presented to Mr. Meyer. Having joined the Public Service Corporation of New Jersey, successor to the United Electric Company, in 1903 as engineering assistant, Mr. Meyer has passed successively through all of the engineering branches of the central-station industry and is today a recognized authority on central-station practice. He is widely known in the engineering world for the contributions he has made to the literature on electric transmission and distribution and he has always given generously of his time to the activities of the various engineering societies, being a member of the American Institute of Electrical Engineers, the American Electric Railway Association, the American Society of Mechanical Engineers and in addition he has served on several committees of the National Electric Light Association.

W. H. Burke New President of Southwestern Association

Walter H. Burke, who was elected president of the Southwestern Public Service Association at the recent convention in Dallas, as announced in the May 12 issue of the ELECTRICAL WORLD, has been Southwestern district manager of Stone & Webster, Inc., for the past year. Mr. Burke has been identified with Stone & Webster for some years and has had engineering experience with that organization in various sections of the country. He was graduated from the University of Maine in 1906 and after a short connection with the General Electric Company he entered the public utility field. He spent one year in the Boston office of Stone & Webster and then removed to Dallas, Tex., these properties being under the executive management of Stone & Webster. He relinquished his duties as assistant to the manager of the Dallas utility to join the Milwaukee Electric Railway & Light Company. Rejoining the Stone & Webster organization, he served as manager of the Houghton County Electric Light Company and the Houghton County Traction Company, Houghton, Mich., and in the same capacity with the Keokuk (Iowa) Electric Company. He was manager of the Northern Texas Traction Company and the Tarrant County Traction Company before assuming the managership in the Southwest, comprising the plants in Texas, Louisiana, New Mexico and Mexico, with headquarters in Houston, Tex.

W. H. Burke

C. HAROLD BERRY, for nearly three years associate editor of *Power*, a McGraw-Hill publication, has been appointed professor of mechanical engineering in the engineering school of Harvard University, to succeed Dr. Harvey N. Davis, who was recently elected to the presidency of Stevens Institute. The appointment is effective Sept. 1, 1928. Prior to his connection with *Power*, Mr. Berry was with the Detroit Edison Company as technical engineer of power plants, responsible for testing and operating economy in the four steam generating stations of that company. He has been active in the American Society of Mechanical Engineers as a member of the power tests code committee and of the subcommittee on steam turbines.

LOUIS LARSEN, formerly connected with the Sundh Electric Company, Newark, N. J., is now vice-president and secretary of the Wagner Engineering Company, Inc., contracting engineers of New York. Mr. Larsen's resignation as general manager of the Sundh Electric Company followed a period of service which covered 26 years. He started with the organization when it was formed by Mr. Sundh and before becoming general manager he served as works manager and chief engineer. During his connection with the company he was granted many patents on control equipment and in addition he represented the company as executive member in the old Electric Power Club and later in the National Electrical Manufacturers' Association.

Obituary

JOHN W. ROBB of Clinton, Ind., one of the organizers of the Clinton Electric Company in 1890 and past-president of the Indiana Electric Light Association, recently died. Mr. Robb had been identified with the business, church and philanthropic life of his home city for many years. A native of Highland County, Ohio, he entered the mercantile business in Bainbridge, O. Subsequently he took an active part in the affairs of the Wabash Valley Electric Company, which absorbed the Clinton Electric Company some years ago.

JOHN B. THOMAS, who had been identified with the Westinghouse company for the past 52 years, died recently at his home in Pittsburgh, Pa. At the time of his death Mr. Thomas was assigned to special duty with the company. Mr. Thomas entered the employ of the Westinghouse company in 1876 and had been with Westinghouse companies since that date. In 1886 he was sent by George Westinghouse to Paris to manage the French branch of the air-brake company. He returned in 1888 and was transferred to the Westinghouse Electric & Manufacturing Company, with which organization he remained until his death.

Financial and Statistical News

Stocks Recover Sharply Earnings Up 7 Per Cent

THE extent to which the drastic selling movement in the security markets early this week affected the power and light stocks is seen in an eleven-point drop in the ELECTRICAL WORLD index of common stocks. This index opened the year at 122, rose fairly steadily to 157 on May 19, and then receded to 142, a fifteen-point drop from the year's high. Its position over a longer period is seen by a comparison with this week last year, when it stood at 108, and the same week two years ago, when it stood at 90. The power and light stocks, however, were among the first to recover after the selling wave subsided.

Power and light company annual reports for 1927 continue to show an increase in gross revenue of about 7 per cent, on the average, over 1926. This is regarded as a normal increase and, as normally, the utilities continue to show a decided stability in earnings in the face of a revenue decline in the case of many of the large transportation systems and industrial companies.

Power and light company bond prices have been well maintained without much change from recent levels. There is evidence in the bond market in general of some fluctuation in quotations from recent peaks and fractionally lower prices are recorded in several issues.

New Italian Loan Floated

The Piedmont Hydro-Electric Company (Società Idroelettricà Piemonte) made an offering of first mortgage gold notes to the amount of $4,000,000, the price being 99¾ and interest, to yield about 5¾ per cent. These one-year 5½ per cent notes were dated June 15, 1928, and mature June 15, 1929. Proceeds will be applied to the acquisition and construction of generating plants, substations and transmission and distribution lines, or to the reduction of debt incurred for these purposes, and for other corporate purposes.

Date Set for Indiana Merger

A compromise basis for exchange of securities, announced by Halsey, Stuart & Company, of Chicago, indicates that the proposed merger of the Terre Haute, Indianapolis & Eastern Traction Company and the Central Indiana Power Company, under the title of the Indiana Electric Corporation, either is to be declared operative or entirely abandoned soon after July 1. It is believed that the exchange plan will be acceptable because it was proposed by committees of affected bondholders and stockholders and that the merger will be consummated. The proposal follows:

That holders of the first mortgage bonds of three companies—Indianapolis & Northwestern Traction Company, Indianapolis & Martinsville Rapid Transit Company and Indianapolis, Crawfordsville & Danville Electric Railway Company—are to receive one share of Indiana Electric Corporation preferred stock, series A, for each $100 principal amount of bonds.

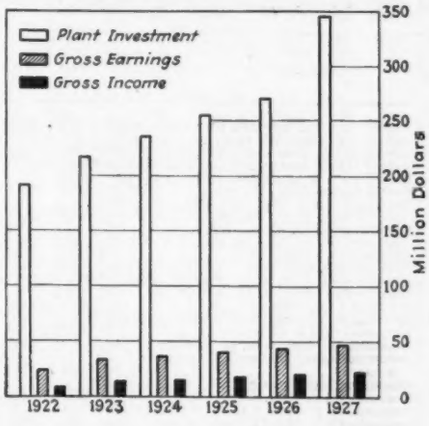
That holders of the 5 per cent cumulative preferred stock of two companies—Indianapolis & Northwestern Traction Company and Indianapolis, Crawfordsville & Danville Electric Railway Company—are to receive Indiana Electric Corporation preferred stock, series B, on a par for par basis.

German Company Offers Debentures

Gesellschaft für elektrische Unternehmungen (Corporation for Electrical Enterprises), or Gesfürel, issued during the past week 6 per cent sinking fund gold debentures (with stock purchase warrants) to the amount of $5,000,000 at 100 and interest, yielding 6 per cent. The organization, formed in 1894, is one of the leading factors in the development of the electric light and power industry in Germany and in Europe generally.

American Water Works & Electric Builds More Economical Structure

AN INCREASE of 11 per cent in the operating costs of the American Water Works & Electric Company held the rise in gross income to slightly over 4 per cent, although gross earnings increased approximately 8 per cent.



Six years development of American Water Works

The operating ratio rose slightly from 51 per cent in 1926 to 53 per cent last year.

Serving sections of Pennsylvania, Maryland, Virginia, West Virginia and Ohio through a group of subsidiaries operating electric, gas and transportation properties, this holding company has gradually added new units and consolidated them into its system. The group has property, plant and investments valued at approximately $346,500,000 and, with earnings of $48,727,401, showed a property investment of slightly over $7 per dollar of gross earnings last year.

The capital structure of the American Water Works & Electric Company was revamped last year. The entire issue of 7 per cent preferred stock of the old company was called for payment or exchangeable into a 6 per cent preferred stock of the new company. Common stock of the old company was exchanged for common of the new on the basis of two new shares for one old. Per share earnings on the old $20 par common stock were $5.47 in 1926. Last year there was a balance for dividends and surplus of $4,860,146. Preferred dividends would require $1,200,000, leaving $3,660,146 for 1,361,413 shares of no-par common stock, or about $2.70 a share. The stock is currently selling around $56, or about twenty times earnings.

American Water Works & Electric common stock incidentally has proved more than ordinarily remunerative to holders over a period. The average price in 1923 was about 36. In 1924 there was a five-for-one split from $100 to $20 par. This, along with last year's two-for-one split, brings the current value of the new stock to around $630. This growth compares very favorably with that of any comparable company.

The purpose of the recapitalization plan was to produce a more economical means of providing new capital for the rapid growth and profitable extension of the company's business. The change to a Delaware charter allowed the issuance of preferred stock bearing a lower dividend rate than was possible under the old company. There was also a saving in the annual tax bill, and since the stock of a Delaware corporation is not subject to the Delaware inheritance tax when held by non-residents of Delaware it would be of importance to the vast majority of common stockholders, who were subject to the Virginia inheritance tax.

Buffalo, Niagara & Eastern Sells Stock Issue

In connection with its large-scale simplification and consolidation program the Buffalo, Niagara & Eastern Power Corporation will now issue 350,000 shares of 5 per cent cumulative first preferred stock at a price of 95½ and accrued dividend. Around 290,000

shares were placed through exchange for preferred stocks of subsidiaries and the balance is being offered subject to prior sale. In other words, the issue is entirely for refunding purposes and is an important step in the simplifying of the new capital structure. After completion of the present financing the capitalization of the parent company will comprise two preferred issues, two common issues and a small amount of scrip, and the stocks of the corporation junior to the first preferred stock, which is the present issue, have a market value, based on current quotations, in excess of $150,000,000.

CENTRAL STATES ELECTRIC DECLARES INITIAL STOCK DIVIDEND.—An initial quarterly stock dividend of 2½ per cent (1/40 of a share) in common stock, together with the regular cash quarterly dividend of 25 cents per share, was declared on the common stock of the Central States Electric Corporation at a meeting of the board of directors held June 5, payable July 2 to stockholders of record June 11. It is expected that this 2½ per cent quarterly stock dividend marks the inauguration of regular dividends at the annual rate of 10 per cent in common stock and $1 in cash. The directors also declared a regular quarterly dividend of $1.75 per share on the 7 per cent preferred stock, payable June 30 to stockholders of record June 9, and $1.50 per share on the 6 per cent cumulative preferred stock, payable July 2 to stockholders of record June 11.

RECENT LISTINGS.—The New York Stock Exchange has authorized the listing of 49,310 shares of $6 preferred stock of the American & Foreign Power Company, Inc., without par value, on official notice of issuance, in exchange for securities of the Mexican Utilities Company. Recently there has also been authorized for listing (a) 38,736 additional shares of common stock of the American Power & Light Company on official notice of issuance and distribution in payment of a stock dividend and 65,000 shares of common stock on official notice of issuance for a consideration of cash at the rate of not less than $83 per share, making the total amount of common stock applied for 2,085,758 shares; (b) 787,601 shares of preferred stock ($6 cumulative dividend) now outstanding in the hands of the public and 9,727 shares of preferred stock ($6 cumulative dividend) on official notice of issuance in exchange for common stock of the Washington Water Power Company, making the total amount of preferred stock applied for 797,328 shares. Preferred stock of the Standard Gas & Electric Company ($4 cumulative preferred) has been authorized for listing to the amount of 535,259 shares on official notice of issuance of temporary interchangeable $4 cumulative preferred stock certificates in exchange, share for share, for the 8 per cent cumulative preferred stock (par $50 per share) which at the present time is listed on the big board.

FURTHER EXPANSION ANNOUNCED FOR SHAWINIGAN COMPANY.—Stockholders of the Shawinigan Water & Power Company will be asked at a spe-

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday June 12	Low 1928	High 1928
ABITIBI PWR. & PAPER, com., new—no par	61½	57	85
Ala. Pwr., $7 cum. pf.—no par	115½	114	116
Allis-Chalmers Mfg., 6% com.	117	115½	129½
Aluminum Co. of Amer., com.	150½	120	197½
Aluminum Co. of Amer., 6% pf.	m109½	105½	110½
Amer. & Foreign Pwr., 7% pf.—no par	108½	105½	110
Amer. & Foreign Pwr., com.—no par	32½	22½	38½
Amer. Bosch Magneto, com.—no par	31½	15½	41
Amer. Brown Boveri Elec.†	16½	10½	26½
Amer. Brown Boveri Elec., pf. $7	58½	40	65
Amer. Gas & Elec., 6% pf.—no par	m107½	106½	111
Amer. Gas & Elec., com. †—no par	156	117½	184
Amer. Lt. & Trac., 6% pf.	m 114	116	120
Amer. Lt. & Trac., new com.	216½	170	249
Amer. Pwr. & Lt., 5% pf.	81½	81	87
Amer. Pwr. & Lt., com. †—no par	77½	62½	95
Amer. Pub. Serv., 7% pf.	a103½	97½	104
Amer. Pub. Serv., com. †	m 60	70	75
Amer. Pub. Utilities, 7% ptc. pf.	a 96	96	97½
Amer. Pub. Utilities, 7% pr. pf.	a102	95½	103
Amer. Pub. Utilities, com.	m 50	....	....
Amer. States Sec., A.	a 11	4	13½
Amer. States Sec., B.	a 14	4½	17½
Amer. Superpwr., 6% 1st pf.	i102½	....	....
Amer. Super pwr., Class A†—no par	36½	35½	56
Amer. Super pwr., Class B†—no par	37½	36½	56½
Amer. Wtr. Wks. & Elec., 6% pf.—ex. div.	102½	101½	106
Amer. W. W. & E., com. new—no par	57	52	70½
Anaconda Copper cap. $3	65½	53½	74½
Appalachian Electric Pwr., 7% pf.	m108½	108½	110
Arkansas Pwr. & Lt. 7% pf.	107½	108	109½
Assoc. Gas & Elec., $3.50—50	52	....	....
Assoc. Gas & Elec., pf.—$6—no par	93	96	98½
Assoc. G. & E., Class A, 10—no par.	48	46½	56½
BABCOCK & WILCOX, 7% com.	119½	117½	128
Binghamton L., H. & P., $6 pf.	106	102	109½
Birmingham Elec., pf.—$6—no par.	m106	104	107
Blackstone Valley G. & E., 6% pf.	m109	106	112
Blackstone Valley Gas & Elec., 10% com.—$0.	m165	135	170
Blaw-Knox, com.†	d106½	91	108
Brasilian Trac., Lt. & Pwr., com., new	f 54	....	....
Broad River Pwr., 7% pf.	105	105	108½
Brooklyn Edison, 8% com.	239½	206½	268½
Buffalo, Niagara & East. Pwr., $1.60 pf.—35	f26	....	..
Buffalo, Niagara & East. Pwr. com., $1.20—no par	f 39	....	....
CALIFORNIA ELEC. GENERATING, 6% pf.	m 99	98	101
Carolina Pwr. & Lt., pf.—$7—no par	f111½	109	111
Central & S. W. Util., $7 pf.—no par	a104	99½	105½
Central & S. W. Util., pr. in. $7 pf.—no par.	a109	103½	112
Central Ark. Ry. & Lt., 7% pf.	106	105	107½
Central Ill. Pub. Serv., $6 pf.	a 99	97½	100½
Central Ind. Pwr., 7% pf.	a 99½	95	101
Central Maine Power, 6% pf.	97	96	98½
Central Maine Power, 7%	110	109	112
Central Pwr. & Lt., 7% pf.	108	104½	114
Central States Elec., 7% pf.	117	104½	121½
Cincinnati Gas & Elec., 5% com.	g100½	....	....
Cities Service, $6 pf.—no par	i 102½	94½	103½
Cities Service, pf. B—no par	i 9½	8½	9½
Cities Service, pf. BB—no par	i 96	88½	97
Cities Service, com.—20	i 71½	54	71½
Cities Service, Bks. Shrs.—10	i 33½	26½	35½
Cities Service Pwr. & Lt., 7% pf.	m108	106	109½
Cities Service Pwr. & Lt., 6% pf.	100½	95½	102
Cleveland Elec. Illg., 6% pf.	113	113	115½
Cleveland Elec. Illg., 10% com.	425	350	425
Columbia Gas & Elec., 6% pf.	109	107½	110½
Columbia G. & E. com. $5—no par.	104½	89½	118½
Columbus Elec. & Pwr., $2 com.—no par.	n 79	66	79½
Columbus Elec. & Pwr., 7%	110	....	....
Columbus Ry., Pwr. & Lt., 7%	108	107	111
Columbus Ry., Pwr. & Lt., 7% pf. B	107	105	111
Columbus Ry., P. & Lt. com. no par	125	120	125
Commonwealth Edison, 8% com.	a181	165	189
Commonwealth Pwr., 6% pf.	103½	102½	104½
Commonw'th Pwr., $2, com.—no par	72½	62½	87½
Conn. Lt. & Pwr., 8% pf.	121	120	123
Conn. Lt. & Pwr., 7% pf.	117½	118	121
Cons. Gas of N. Y., pf.	101	101	105
Cons. Gas of N. Y., com. $5—no par.	144½	119½	170½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6% pf.	a111	110	114½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 5% pf.	a100	100½	105½
Cons. Gas, Elec. Lt. & Pwr. of Balti., com. $3.00—no par.	c 82	67½	93
Consolidated Pwr. & Lt., 7% pf.	105	....	....
Consumers Pwr., 6% pf.	104	105½	106½
Consumers Pwr., 6.6% pf.	105	106	107
Continental Gas & Elec., 7% pr. pf.	108	106½	108½
Conti. G. & E. com. $4.40—no par.	m250	240	265
Crocker Wheeler, com.†	65	23	70
Crocker Wheeler, 7% pf.	96	....	....
DALLAS PWR. & LT., 7% pf.	110½	110	111½
Dayton Pwr. & Lt., 6% pf.	108	108½	110½
Derby Gas & Elec., 7% pf.	101½	96	100½
Detroit Edison, 8% com.	194½	166½	209½
Dubilier Condenser, com.—no par.	4	2½	5½
Duke Pwr., cap.	m140	130	145
Duquesne Lt., 5% pf.	101	101	116½
EASTERN NEW YORK UTIL., $7 pf.	m110	111	112½
Eastern States Pwr. B	22	11½	26½
Eastern States Pwr., pf.	m108	98	100½
East. Tex. Elec., 7% pf.	108	106	109
Edison Elec. of Boston, $12 com.	d277	252	305
El Paso Elec. 7% pf.	115	110	112½
Elec. Bond & Share, 6% pf.	f110½	108½	111½
Elec. Bd. & Sh. Sec., com. $1—no par	f110½	76	127½
Electric Household Util.†	a 23½	13½	27
Elec. Investors, 6% pf.—no par.	102	101	104½
Elec. Investors, com.†—no par.	64½	40½	79½
Elec. Pwr. & Lt., ctfs. pf.	109½	106½	110½
Elec. Pwr. & Lt., ctfs., com.—no par	35	28½	45½
Elec. Ry. Securities, com.—no par.	6½	....	....
Elec. St. Battery com. $5.25—no par	76½	69	84½
Elmira Wtr., Lt. & R.R., 7% pf.	m114	104	115
Empire Pwr., ptc.†	34½	30	39½
Engr. Pub. Serv. $5, pf.—no par	m 99½	99½	102
Engr. Pub. Serv. com.—no par.	38½	33	46½
Eureka Vacuum Cleaner, com. $4—no par.	67	66	79
FAIRBANKS MORSE, 7% pf.	m108½	104	114½
F.-M., com.—$3—no par—ex. div.	39½	32½	54
Federal Lt. & Trac., com. $1.40	54½	42	56½
Federal Lt. & Trac., $6 pf.—no par	m105	98	109
Florida Pwr. & Lt., 7% pf.	106½	104½	108½
Ft. Worth Pwr. & Lt., 7% pf.	i 113	113	114½
GALVESTON-HOUSTON ELEC. 6% pf.	80	75	85
Galveston-Houston Elec., com.	35	31½	35
General Cable, Cl. A	66½	56	84½
Gen. Elec. $3 com.—no par	148½	124	174½
Gen. Elec., special—6%	11½	11½	11½
Gen. Gas & Elec. (Del.) com A $1.50—no par—ex. div.	42½	35½	50½
Gen. G. & E. (Del.) pf. A $8—no par	m133	125	144
Gen. G. & E. (Del.) pf. A $7—no par.	m111	110	120
Gen. G. & E. (Del.) pf. B $7	m111	104	117
Gen. Pub. Serv., $7 pf.	126	115	140
Gen. Pub. Serv., com., no par.	23½	16½	29
General Public Utilities, $7 pf.	m101½	98	103
Ga. Lt., Pwr. & Rys., com.	m 58	55	65
Gt. Western Pwr., 7% pf.	h103	....	....
IDAHO PWR., 7% pf.	108	109	111½
Ill. No. Utilities, 6% pf.	m 99	96	100
Ill. Pwr. & Lt., 7% pf.	105½	103	107
Indianapolis Pwr. & Lt., 6½% pf.	107	102	107½
Indianapolis Pwr. & Lt., $7 pf.	101	100	105
Ingersoll Rand, com.	92½	90	98
Int. Combus. Engr., com. $2—no par	59	45½	72½
Int. Combustion Engr., 7% pf.	m108½	103	109
Int. Util., Class A—$3.50—no par.	47½	44½	52
Int. Utilities, Class B—no par.	14½	6½	19½
Interstate Pwr., pf.—$7—no par.	103	99	105
Interstate Pub. Serv., 7% pf.	m105½	103	108
Iowa Ry. & Lt., 7% pf.	106½	105	107
JERSEY CENTRAL PWR. & LT. CO., 7% pf.	106½	105	107
Johns-Manville, com.†—no par.	113	107	134

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington; *k*Cleveland. *l*Bid price Wednesday, June 13. *m*Bid price Saturday, June 9. *n*Latest quotations available. †Dividend rate variable.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday June 12	Low 1928	High 1928
KANSAS CITY POWER & LIGHT pf. $7	m110¼	109	114
Kansas Gas & Elec. 7% pf.	*l*109	107	110
Kelvinator Corp.	16	11¼	22¼
Kentucky Hydro-Elec., 7% pf.	m104	100	105
Kentucky Sec., 6% pf.	95	94	98
Kentucky Sec., 5% com.	150	140	150
Kentucky Utilities, 6% pf.	m104	100	105
LACLEDE GAS LT., 10% com.	m200	200	260
Lehigh Pwr. Sec., com.—no par	m 65	19¼	65
Long Island Ltg., 7% pf.	m110	110¼	112¼
Long Island Ltg., 6% pf.	m107½	107	109
Long Island Ltg., com.†—no par	m250	170	250
Los Angeles Gas & Elec., 6% pf.	111	105	112
Louisville Gas & Elec., cl. A. $1.75	34¼	28	41
MAN. ELEC. SUPPLY, cap. $5—no par	63¼	50	66¼
Maytag Co., com. 50—no par	19½	19	40½
Memphis P. & L., pf.—$7—no par	m109½	109	111
Metropolitan Ed., pf.—$6—no par	105½	103	109½
Metropolitan Ed., pf.—$7—no par	109	109	111¼
Metropolitan Ed., com. $3—no par	m170	125	185
Middle West Utilities, 6% pf.	a 99½	93¼	100¼
Middle West Util., 6% pr. lien	a103	99	108
Middle West Util., com. $7—no par	a145½	123½	169
Midland Utilities, pr. ln. 6% pf.	a 95½	94¼	97
Midland Utilities, 7% pf. A	a 90½	89¼	92½
Milwaukee Elec. Ry. & Lt., 7% pf.	m104	100	106
Milwaukee Elec. Ry. & Lt., 6% pf.	m108	98	110
Minn. Pwr. & Lt., 7% pf.	*l*108½	107	109
Miss. River Pwr., 6% pf.	111½	94	112½
Mohawk Hudson Pwr., 1st pf.—$7—no par	m107	100	110
Mohawk Hudson Pwr., 2d pf.—$7—no par	m105	100	109
Mohawk Hudson Pwr., com.—no par	39½	29½	53
Montana Pwr., 5% com. ex. div.	163	102½	175
Montreal Pwr., 7% com.	n 107	....	....
Mountain States Pwr., 7% pf.	m104	97	105
Mountain States Pwr., com.†	18½	....	....
NASSAU & SUFFOLK LTG., 7% pf.	110	98	110½
National Carbon, 8% pf.	a138	136½	139½
National Elec. Pwr., A†	a 32½	27¼	42
National Pwr. & Lt., pf.—$6—no par	m103	102	106
National Pwr. & Lt., com.†—no par.	32½	21½	36½
National Pub. Serv., 7% pf.	103	99	104
National Pub. Serv., 7% pfc., pf.	n114	....	....
National Pub. Serv., A com. $1.60—no par	27½	22	29½
National Pub. Serv., B com.—no par	30	24½	34½
Nebraska Pwr., 7% pf.	*l*110	110	111½
Nevada-Calif. Elec., com.	m 47	33½	50
New Brunswick Pwr., 4% pf.	m 63	60	70
New Eng. Pub. Serv., pr. ln. pf. $7	m110	98½	110½
New Eng. Pub. Serv., pf. $7	m106	95	108
New Orleans Pub. Serv.—7% pf.	107½	106	110
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	102	91	104
N. Y. Central Elec., 7% pf.	m106	101	107
New York Power & Light 7% pf.	114	....	....
Niagara Falls Pwr., 7% pf.—25	m 27½	27¼	29½
No. Amer., 6% pf.—50	55	53½	55½
No. Amer., com.—10	68½	58¼	78½
No. Amer. Edison, $6 pf.—no par	100½	100½	105½
Northeastern Pwr., com.	28½	19½	31
No. N. Y. Utilities, 7% pf.	108	103	109
No. Ohio Pwr., com.—no par	26½	18	32
Northern Ohio Pwr. & Lt., 6% pf.	m 99	90	100
No. Ont. Lt. & Pr. 6% pf.	m 99	94	100
No. States Pwr. (Del.), 7% pf.	m109½	101	110
No. States Pwr. (Del.), 8% com.	137	123	152
No. Texas Elec., 6% pf.	55	45	70
No. Texas Elec., com.	19	....	....
OHIO BRASS, com. B $4—no par.	m 97½	89	100½
Ohio Brass, 6% pf.	m105	106	111
Ohio Pwr., 6% pf.	m107	104	109½
Ohio Pub. Serv., $6 pf.	m103	95	105
Ohio Pub. Serv., 7% pf.	111	107	112
Ohio River Edison, 7% pf.	109½	106	109½
Oklahoma Gas & Elec., 7% pf.	109	106	115½
PACIFIC GAS & ELEC., 6% pf.	26½	26½	30
Pacific Gas & Elec., 8% new com.	46	43½	53½
Pacific Pwr. & Lt., 7% pf.	*l*110	106	110
Packard Electric	£ 68	47	68
Penn Cent. Lt. & Pwr., $5 pf.—no par	*c* 80	79½	82
Penn-Ohio Edison, 6% pf. no par	m 98	78	99
Penn-Ohio Edison, 7% pf.	106½	106	109
Penn-Ohio Pwr. & Lt., 7% pf.	109	....	....
Penn Pwr. & Lt.—$7—no par	*l*110	109½	110½
Penn Wtr. & Pwr., $2.50 com., new	*e* 80	68	90
Phila. Co., 5% pf.—50	m 46½	45¼	48¼
Phila. Co., 6% pf.—50	m 54	52	57
Phila. Co., com.—50	160	145	174½
Phila. Elec., 8% com.—25	*c* 68	55½	74½
Portland Elec. Pwr., 7% pf.	104	....	....
Portland Elec. Pwr., 6% pf.	95	78	96
Portland Elec. Pwr., 6% 2d pf.	83	55	88
Portland Elec. Pwr., com.	43	....	....
Potomac Elec. Power, 6% pf.	*j*111½	....	....
Pwr. Sec., pf.—no par	m 65	50	68
Pwr. Sec., com.—no par	m 14½	11¼	14½
Public Serv. of Colorado, 7% pf.	108	....	....
Pub. Serv. of N. J., 6% pf.	111	103½	115
Pub. Serv. of N. J., 7% pf.	m129½	118	129½
Pub. Serv. of N. J., $2 com.—no par	54½	41¼	66¼
Pub. Serv. of No. Ill., 6% pf.	*a*117	110	117
P. S. of No. Ill., com. $8—no par	*a*180½	159½	190½
Pub. Serv. of No. Ill., $8 com.	*a*181	139½	190
Pub. Serv. of Okla., 7% pr. ln.	m105	100	107
Pub. Serv. Elec. & Gas, 6% pf.	107½	107½	110½
Puget Sound Pwr. & Lt., 7% pf.	m110	105	110
Puget Sound Pwr. & Lt., $6 pf.—no par	101	92	105½
Puget Sound Pwr. & Lt., com.	68½	34½	84½
RADIO CORP. OF AMER., $3.50 pf.—50	m57	54½	60
Radio Corp. of Amer., com.—no par	196½	85½	224
Rochester Gas & Elec. 6% pf. D	m105	105½	105½
Rochester Gas & Elec., 7% pf. B	107½	105	108
Rochester Gas & Elec., 6% pf. C	105	105½	106½
SAN JOAQUIN Lt. & Pwr., 7% pr. pf.	m115	110	117½
St. Joseph Ry., L., H. & P., 5% pf.	m 75	70	75
Servel, Inc.	14½	4½	17½
Sierra Pacific Elec., 2% com.	35½	29	40½
Sioux City Gas & Elec., 7% pf.	106½	100	108½
Southeastern Pwr. & Lt., pf.—$7—no par	*l*109	....	....
Southeastern Pwr. & Lt., pfc. pf.	*l* 88	....	....
Southeastern Pwr. & Lt., com.—no par	49½	40¼	61
So. Calif. Edison, 8% pf.	m50	38½	53
So. Calif. Edison, 7% pf.	29	28½	30
So. Calif. Edison, 6% pf.	26	25½	27½
So. Calif. Edison, 8% com.	45½	43½	53½
Southern Cities Utilities, 7% pf.	m 83	75	92
Southwestern Lt. & Pwr., A $3	80	60	80
Southwestern Lt. & Pwr., B	70	....	....
Southwestern Lt. & Pwr., $6 pf.	93	88	96½
Southwestern Pwr. & Lt., 7% pf.	m111	103	115
Standard Gas & Elec., 8% pf., ex. rts.	69½	65	71½
Standard Gas & Elec., 7% pr. pf.	113½	108	115
Standard G. & E., com. $3.50	64½	57½	74½
Standard Power & Light, com.	51	29½	58½
Standard Pwr. & Lt., 7% pf.	m105	98	106
Staten Island Edison, pf.—$6—no par	100	99	103½
Superheater, $6 com.—no par	153½	149½	178
Syracuse Lighting, 7% pf.	m111	103	112½
Syracuse Lighting, 8% pf.	m120	114	121
TAMPA ELEC., com. $2	m 67½	62	71
Tenn. Elec. Pwr., 6% pf.	101	92	103
Tenn. Elec. Pwr., 7% pf.	109½	107	110
Tex. Pwr. & Lt., 7% pf.	*l*113½	113½	115
Tide Water Pwr., 8% pf.	110	108	112
Timken Roller Bear., com.—$4 no par	119½	112½	134
Toledo Edison, 7% pf.	109	108	111
Toledo Edison, 6% pf.	m104	95	105
Toledo Edison, 6% com.	m145	120	150
Tri-City Ry. & Lt., 6% pf.	m 92	88	102
UNITED GAS & ELEC., 7% pf.	97	98	103
United Gas & Elec. (N. J.), 5% pf.	75	70	77
United Gas Impr., 8% com.—50	*c*137½	114½	149½
United Lt. & Pwr., pf.—$4—no par	m 56½	49	56½
United Lt. & Pwr., pf.—$6.50—no par	m100	95	101½
United L. & P., com. A .48—no par.	21½	13½	26½
United L. & P., com. B .48—no par.	27½	20	31
Utah Pwr. & Lt., 7% pf.—ex. div.	*l*109½	109½	112
Utica Gas & Elec., 7% pf.	104	105	106½
Utica Gas & Elec., 8% com.	m200	215	225
Utilities Pwr. & Lt., 7% pf.	103	98	104
Utilities Pwr. & Lt., com. A $2	37½	28½	45½
Utilities Pwr. & Lt., com. B $1—no par	27½	18½	32½
VERMONT HYDRO-ELEC., 7% pf.	m100	95	102
Virginia Elec. & Pwr., 7% pf.	m108	103	111
Virginia Public Service 7% pf.	104	97	104
WAGNER ELEC., 7% pf.	*h*108½	96½	107
Wagner Elec., com.—no par	*b* 77½	37	120
Washington Ry. & Elec., 7% com.	*j* 450	....	....
Washington Ry. & Elec., 5% pf.	*j*100½	....	....
Washington Wtr. Pwr., 8% com.	m227	175	235
West Penn Elec., 6% pf.	111	108½	115
West Penn Elec., Cl. A $7	m109	106½	112
West Penn Pwr., 7% pf.	116½	114½	117
West Penn Pwr., 6% pf.	m108½	108	113
West Virginia Lt., Ht. & Pwr., 7% pf.	m 95	94	100
Western Pwr., 7% pf.	m104	98	105
Western States Gas & Elec., 7% pf.	99	100	106
Western States Gas & Elec., com.	38	....	....
Westinghouse Elec. & Mfg., 8% com.—50	95½	88½	112
Weston Elec. Instrument, Cl. A $2—no par	34½	30½	36½
Weston Elec. Instrument, com.—no par	22½	12½	28½
Wheeling Elec., 6% pf.	m 108	95	109
Worthington Pump, 7% pf. A	m 52	46½	58½
Worthington Pump, 6% B	m 47	41	51
Worthington Pump, com.	32½	28	37½
YALE & TOWNE com. [$5—25.	71	68½	84½

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington; *k*Cleveland. *l*Bid price Wednesday, June 13. *m*Bid price Saturday, June 9. *n*Latest quotations available. †Dividend rate variable.

cial meeting called for June 26 to approve an increase in the authorized common stock from 1,600,000 to 2,600,000 shares, the additional 1,000,000 no par shares to be issued from time to time as deemed necessary by the directors. This represents the second increase which has been made in the capitalization this year, the former increase, which was from 1,200,000 to 1,600,000 shares, having been authorized at a special meeting of the shareholders held Feb. 21.

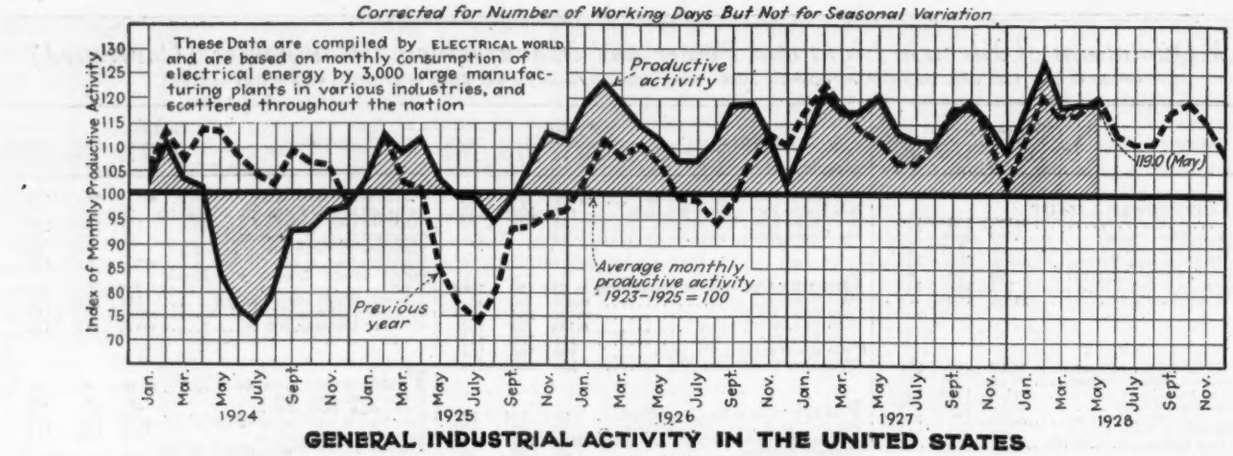
MAYTAG COMPANY PLACES COMMON STOCK ON ANNUAL DIVIDEND BASIS.—The directors of the Maytag Company have declared an initial quarterly dividend of 37½ cents per share on the new common stock of the Maytag Company, no par value, payable July 1 to holders of record June 15.

Southeastern Power Plans Capital Increase

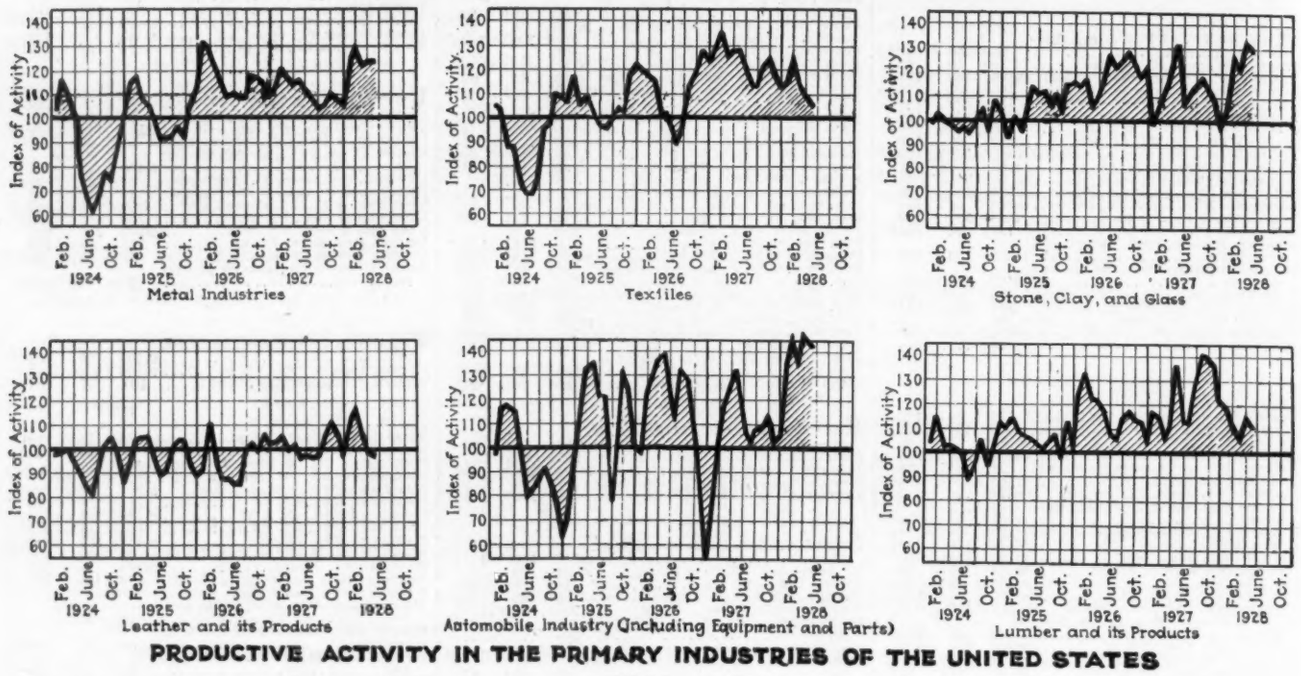
Directors of the Southeastern Power & Light Company have proposed increasing its capitalization from 7,000,000 shares to 8,000,000 shares through the creation of 1,000,000 shares of $5 dividend preferred stock. Shareholders will be asked to approve the proposal at the annual meeting on July 11.

The present capitalization of Southeastern comprises 750,000 shares of $7 preferred, 250,000 shares of $6 preferred, 1,000,000 shares of participating preferred and 5,000,000 shares of common, all of which have no par value. The new $5 preferred issue would rank *pari passu* with the $6 and $7 preferred stock. The company announces it has no plans for issuing the new preferred stock immediately, and that it will be created solely to provide a means for more economical future financing.

GENERAL PUBLIC SERVICE TO INCREASE PREFERRED STOCK.—The directors of the General Public Service Corporation have called a special meeting of stockholders for June 21 to vote on an increase in preferred stock from 75,000 to 175,000 shares as a preliminary to reconstruction of the capital base of the company. In a statement explaining the proposed increase, C. W. Kellogg, president, said the corporation had an exceptionally large equity base, more than 50 per cent of its asset value being represented by common stock and an additional 14 per cent being represented by convertible preferred stock which was junior to the preferred stock.



GENERAL INDUSTRIAL ACTIVITY IN THE UNITED STATES



PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE UNITED STATES

High Productive Operations Maintained During May

THAT the volume of general production during the first five months of the current year has been about 2.7 per cent above that during the same period in 1927 is indicated by reports on electrical energy consumption received by the ELECTRICAL WORLD from approximately 3,000 large manufacturing plants scattered throughout the nation and in various industries, plants consuming more than 15,000,000,000 kw.-hr. of electrical energy per annum. The basic figures indicate that eight of the primary industrial groups—rolling mills and steel plants, ferrous and non-ferrous metal working plants, leather and its products, automobile, stone, clay and glass, rubber and its products, chemicals and allied products, and food and kindred products—turned out a volume of products during the period greater than in 1927, although in some of the groups the increased volume was only slight. On the other hand, four just as important industrial groups—textiles, lumber and its products, paper and pulp, and shipbuilding — were operating during these five months as a whole at a lower rate than in 1927.

The rate of industrial production during May was about 0.2 per cent under April and about 1.3 per cent under May of last year. This is the first time since last September that the index of industrial activity has been under that of the same month in the year previous. May was the peak month of industrial activity last year, while the indications seem to be that the peak of activities during the current year were reached in February.

The index of activity in general industry based on consumption of electrical energy stands at 119.0 for May, as compared with 119.3 for April. Comparative index of productive activity referred to the average activity for the period 1923-25 as 100 and adjusted for number of working days are as follows:

May, 1928	119.0
April, 1928	119.3
March, 1928	118.2
May, 1927	120.7
Average first five months of 1928	120.5
Average first five months of 1927	117.3

The rate of operations in the rolling mills and steel plants was quite significant, standing at almost the same in April and even above that of March. The usual seasonal decrease in the rate of activities of this industry has not been made apparent so far this year. The May operations were about 2.1 per cent over those of May last year. The ferrous and non-ferrous metal working plants have also increased their rate of operations during the past two months, and in May were operating on a plane about 12.5 per cent over last year. The volume of production in these plants since the opening of the year has been about 10 per cent over that of last year. Decreased activities are evident in the automobile industry, May operations being about 4.7 per cent under April, but still 7.6 per cent above May last year.

Business News and Market Conditions

Sales Conference Undertakes Market Study

In furthering its work of developing a selling program for all branches of the industry, the Electrical Industry Sales Conference, through its sales plan committee, has engaged marketing counsel to undertake immediately a research study into all consumer and industry factors governing the market for adequate wiring in the home. Out of the facts obtained will be built the co-operative selling plan for early presentation to the industry. The sales plan committee investigated the field of research and advertising and, after receiving the presentations of a number of representative firms, selected the J. Walter Thompson Company, New York. Messrs. J. E. Davidson, chairman; G. E. Cullinan, vice-chairman; W. E. Sprackling, L. W. Davis, J. E. North and J. L. Ray comprise the sales plan committee, which is also to function as the working contact committee through the study and development of the selling plan.

It will be recalled that, in approaching its work in a definite way, the Electrical Industry Sales Conference, appointed for the purpose of considering and developing a national sales program for the industry, adopted at its first meeting the following resolutions:

That the Industry Sales Conference make as its first objective the development of a broad industry program for its promotion of more adequate house wiring through an organized national movement to rewire the houses now connected to power systems of America where the installations provide inadequate facilities

Value and Destination of Electrical Exports for March, 1928, Compared With Corresponding Month in 1927

Article	March 1927	March 1928
Generators:		
Direct Current:		
Under 500 kw.	$56,347	$146,014
500 kw. and over	30,919	143,124
Alternating current:		
Under 2,000 kva.	11,210	3,665
2,000 kva. and over	36,879	.....
Steam turbine generator sets	22,265	23,502
Accessories and parts for generators	76,108	127,028
Self-contained lighting outfits	99,716	114,140
Batteries:		
Flashlight batteries	191,328	284,246
Other dry and wet cell primary batteries	181,574	276,606
Storage batteries	270,270	347,215
Transforming or converting apparatus:		
Power transformers	237,214	†
Power transformers, 500 kva. and over	*	162,597
Distribution transformers, less than 500 kva.	*	76,581
Other transformers	73,818	†
Instrument transformers	*	5,590
Other transformers, not elsewhere stated	*	60,301
Battery chargers under 15 amp.	*	22,638
Rectifiers, double current and motor generators, dynamotors, synchronous and other converters	95,197	143,731
Transmission and distribution apparatus:		
Switchboard panels, except telephone	81,931	222,124
Switches and circuit breakers over 10 amp.	230,130	120,911
Fuses and fuse blocks	26,730	35,408
Watt-hour and other measuring meters	43,476	87,708
Volt, watt, and ampere meters, and other recording, indicating, and testing apparatus	164,092	†
Electrical indicating instruments	*	24,450
Electrical recording instruments	*	25,207
Other electrical testing apparatus	*	72,758
Lightning arresters, choke coils, reactors and other protective devices	45,723	69,504
Motors, starters and controllers:		
Motors under 1 hp.	187,983	†
Motors ¼ hp. and under	*	171,165
Motors over ¼ hp and under 1 hp.	*	75,057
Stationary motors:		
1 to 200 hp.	302,247	327,147
Over 200 hp.	49,902	41,078
Railway motors	37,130	175,459
Electric locomotives:		
Railway	.....	.....
Mining and industrial	58,396	22,379
Station and warehouse electric motor trucks	21,529	3,238
Starting and controlling equipment:		
For Industrial motors	116,754	130,332
For electric railway and vehicle motors	9,100	6,237
Portable electric tools	83,495	131,601
Accessories and parts for motors	183,541	214,585
Electric appliances:		
Electric fans	107,316	136,907
Electric lamps:		
Metal filament	151,758	131,202
Other electric lamps	31,224	101,353
Flashlights	246,591	312,590
Searchlights and projectors	45,558	55,898
Motor-driven household devices:	237,307	†
Electric vacuum cleaners	*	125,131
Other motor-driven devices, except tools	*	79,124
Electric flatirons	*	29,321
Domestic heating and cooking devices:	136,841	
Electric cooking ranges	*	26,979
Other domestic heating and cooking devices	*	78,464
Industrial electric furnaces and ovens	33,039	17,845
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries, etc.	112,357	167,563
Signal and communication devices:		
Radio apparatus:		
Transmitting sets and parts	69,368	42,726
Receiving sets	196,622	272,024
Tubes	105,534	93,681
Receiving-set components	138,768	209,110
Receiving-set accessories	146,180	240,761
Telegraph apparatus	76,780	57,178
Telephone apparatus:		
Telephone instruments	21,167	22,797
Telephone switchboards	182,259	11,237
Other telephone equipment	360,509	160,352
Railway signals, switches and attachments	129,364	35,572
Bells, buzzers, annunciators, and alarms	30,913	41,058
Other electric apparatus:		
Spark plugs, magnetos, and other ignition apparatus	203,221	†
Spark plugs	*	108,646
Other starting, lighting, and ignition equipment	*	100,096
Insulating material	99,242	119,034
Metal conduit, outlet, and switch boxes	72,635	120,630
Sockets, receptacles, and lighting switches	162,297	190,271
Electric lighting fixtures, interior and street	140,708	†
Electric interior lighting fixtures	*	216,389
Electric street lighting fixtures	*	49,661
Other wiring supplies and line material	93,811	90,057
Other electrical apparatus not elsewhere stated	829,310	624,940
Rubber and friction tape	46,283	47,078
Globes and shades for lighting fixtures	53,301	53,891
Electrical glassware except for lighting	16,839	21,369
Electrical porcelain:		
For less than 6,600 volts	36,704	58,710
For 6,600 volts and over	60,220	88,453
Carbons, carbon brushes, and electrodes:		
Electrodes for electric furnaces	182,040	184,306
Other carbon products	108,580	57,538
Insulated wire and cable (iron or steel)	30,106	22,847
Copper, bare wire	97,022	159,610
Copper, insulated wire and cable	460,328	432,989
Refrigeration sets up to 1 ton capacity	303,957	417,153
Domestic washing machines	87,016	168,412
Totals	$8,668,079	$9,668,279

* Not collected in 1927 in that form. † Data for 1928 collected in more detail as given.

DESTINATION OF ELECTRICAL EXPORTS

Country of Destination	March, 1928 Values
EUROPE:	$2,118,948
Belgium	120,478
France	187,886
Germany	111,176
Italy	138,132
Netherlands	121,519
Spain	247,463
Sweden	48,133
United Kingdom	766,900
Other countries	377,261
WESTERN HEMISPHERE:	$5,001,867
Canada	2,150,849
Mexico	560,607
Cuba	299,048
Argentina	641,556
Brazil	497,588
Chile	119,030
Colombia	159,541
Peru	44,081
Venezuela	108,938
Other countries	420,629
ASIA, AFRICA, AND OCEANIA:	$2,547,464
British India	193,158
China	226,587
Japan	755,772
Philippine Islands	160,135
Australia	528,907
New Zealand	121,801
Union of South Africa	150,681
Other countries	410,423

for the use of complete electrical equipment and also to establish a higher standard of adequacy in the wiring of new houses.

That the conference recognizes that the present status of the electrical house wiring contractor will prove a fundamental factor in the carrying out of any program to promote house wiring and that careful study should be given to this problem in the hope that a way may be found to increase his effectiveness as a creative influence in the development of the electrical market.

The problem of increasing the effectiveness of the house wiring contractor is being considered as the subject of a special program for industry action and is not within the scope of the work assigned to the agency, although, of course, the house wiring contractor will be one of the elements to be considered in the development of the main selling plan.

The scope of the work for which the agency has been engaged is stated as follows:

1. Approaching the problem with the attitude of fundamental analysis, the necessary investigation is to be made which will provide a clear understanding of the market to be influenced, geographically and psychologically, with regard to this problem, as a basis of definite knowledge on which to proceed. This investigation will refer to the present objectives of the conference, as distinguished from a broader investigation of the whole marketing situation of the industry.

2. Interpret the findings of this investigation in the light of broad merchandising experience and with an outside viewpoint.

3. Prepare a comprehensive all-industry selling program founded on the conclusions reached, and comprised of two parts, viz.:

(a) A complete and self-contained localized selling plan, suited to successful promotion and operation in any community. This would be designed as a local co-operative plan, with participation by the electric utility, jobber, contractor, dealer and manufacturer's local representatives.

(b) A national phase to give a national background of advertising and publicity, and to provide the bond for tying the local programs into a national movement.

(It is expected that the program will be built around a new and effective approach that will grip public imagination.)

4. Develop an effective plan for presenting the main selling program to the electrical industry in a way to secure the necessary financial support and participation throughout the country. The industry's existing national and local facilities would, of course, be counted on to perform their proper functions.

Funds for the preliminary investigation and development of the plan have been made available by the national associations. The conference is handling the business arrangements through the board of directors of the Society for Electrical Development and members of the staff are assisting the sales plan committee and the agency in their work.

Market Conditions

STEADY sales reached an aggregate good volume in New England, although individual orders were small. Motor sales were strong and negotiations for heavy equipment are promising. A Massachusetts mill bought $8,000 worth of control equipment. In the Eastern district central-station business shows an upward trend, both as to contracts and inquiries. A Diesel engine unit was purchased by a power company in Georgia and two substation equipment orders from New Jersey and New York totaled $53,000. The market for street-lighting equipment has improved.

The volume of business in the Southeast is up and consists of many small orders. An order for $125,000 worth of power transformers, placed by a company in Alabama, was the only sale of moment. Motors and other electrical equipment purchased by textile mills in Georgia amounted to $23,000. In the St. Louis district general conditions are fair, but sign business is reported as especially good. A substantial volume of business is noted in the Middle West and appears to be increasing from month to month. On the Pacific Coast many equipment orders were placed. Mining and lumber companies were prominent buyers. The Utah Copper Company ordered apparatus for its Bingham plant at a cost of $175,000, and the Miami Copper Company purchased $550,000 worth. The Weyerhauser Company closed a contract for two 750-kw. turbines, costing $230,000, for its mill at Longview, Wash. Seattle will build a substation to cost $1,000,000 complete. Contract for the construction of the Leaburg unit of the Eugene-Oregon hydro-electric project has been let to A. Guthrie & Company of Portland at a cost of $1,029,230.

Non-Ferrous Metals Firm at Unchanged Price Levels

Firm and steady markets for the major non-ferrous metals, tin alone excepted, are the feature. Copper is in fair demand in the domestic market and in exceptionally strong demand from abroad, prices are firm and the possibility of another price advance in the near future is heard. Lead is firm with sales but little below normal. Buyers have re-entered the market for zinc in fair volume and the price is slightly higher than a week ago. Tin is easier and statistics continue to show a mounting production rate.

NEW YORK METAL MARKET PRICES

	June 6, 1928 Cents per Pound	June. 13, 1928 Cents per Pound
Copper, electrolytic	14.525	14.525
Lead, Am. S. & R. price	6.30	6.30
Antimony	10.50	9.75
Nickel, ingot	35	35
Zinc spots	6.487	6.50
Tin, Straits	49.50	48
Aluminum, 99 per cent.	24.30	24.30

Base copper wire price June 13, 1928, 16½ cents.

Utility Demand Improves in Eastern District

Central-station business shows an upward trend in the Eastern district, both with regard to contracts and inquiries. A power company in Georgia has placed an order for a Diesel engine unit for a stand-by steam-electric station with a leading manufacturer in northern New York. A municipality in Missouri has contracted for a turbo-generator unit, with condenser and auxiliaries. A New Jersey central-station company has given an order for transformers and accessory apparatus to total about $25,000, and other contracts are anticipated from this same quarter. A metropolitan utility has placed a similar commitment for substation service, the order aggregating about $28,000. Switching equipment sales give signs of improvement and sizable transactions are expected at an early date. The market for transmission cables, fittings, etc., likewise gives indication of better conditions, following several weeks of lagging interest. Electric equipment for marine service is another branch in which demand is anticipated.

Industrial account continues to be an appreciable factor in the Eastern district, even though the call for motors of industrial ratings shows a little decline, which is considered only as temporary. Meantime, a number of contracts have been placed for prime movers and kindred heavy machinery. A chemical company in New Jersey has ordered a turbo-generator unit, with air-cooled equipment, to cost more than $110,000. An order also was placed for a motor-generator set, with switchboard panel, etc., by a machinery plant in northern New York, at a cost of $20,000. Another maker of motor-generator sets reports an active call from telegraph companies, one order being placed for 125 such units, from 300 to 750-watt rating. Metal-working plants are still in the market for electrical equipment requirements, with other inquiries coming from cement mills, shoe and leather factories, and textile mills. Ice-manufacturing plants are also seeking apparatus and a sizable account is looked for from this branch of activity. In connection with industrial equipment, a leading manufacturer reports that the price trend is downward, while central-station machinery shows development in the other direction. Resale motor business is becoming more pronounced in this section and a considerable quota of recent commitments are of this character. Construction operations in the Eastern district are as follows:

The Westchester Lighting Company, Mount Vernon, N. Y., plans a substation on Waverly Avenue, Mamaroneck, N. Y., to cost $45,000. The Nichols Copper Com-

pany, Laurel Hill, L. I., has purchased property at El Paso, Tex., and will build an electrolytic copper refinery to cost $3,000,000. The Royal Typewriter Company, New York, will add to its factory at Hartford, Conn., to cost $150,000. The West Virginia Pulp & Paper Company, New York, plans an expansion program at its mill at Mechanicsville, N. Y., to cost $650,000. County Supervisors, Rochester, N. Y., plan a highway lighting system for Pittsford, Brighton and other communities. Niagara Falls, N. Y., plans extensions and improvements in the street-lighting system. The Public Service Electric & Gas Company has approved plans for a substation at Jersey City, N. J., to cost $85,000.

J. Lichtman & Sons, Newark, N. J., will add to its leather tannery to cost $300,000. Matawan, N. J., contemplates an improved street-lighting system. The Deborah Sanatorium, Lake Hopatcong, N. J., will build a power plant in connection with new institutional buildings, to cost $800,000. The Ward Baking Company plans a new baking plant at Elizabeth, N. J., to cost $350,000. The United Varnish Company, North Bergen, N. J., will build a factory to cost $90,000. The Atlantic Refining Company, Philadelphia, plans an electric-operated storage and distributing oil works at Jacksonville, Fla., to cost $100,000. The George K. Hale Manufacturing Company, Philadelphia, plans a new bone button factory at Mount Airy, N. C., to cost $75,000. The Pennsylvania Power & Light Company plans extensions in transmission lines from Nescopeck to Dorrance Township, Pa. The Bethlehem Shipbuilding Corporation, Baltimore, Md., plans a fabricating and machine shop addition to cost $400,000.

Substantial Business Noted in Middle West

There is a substantial volume of business being transacted in the Middle West in a varied line of industry, which appears to be increasing from month to month. An increasing amount of construction work is under way, with a slightly decreasing number of unemployed. Indications seem to point to better business ahead, with a favorable month for June. The various utility companies are busy with construction and line extension work and a large amount of underground construction work is in progress.

Among the interesting items ordered were two 100,000-cu.ft.-per-minute air filters, one 600-kva., 12,000-volt distribution transformer, 550 direct-current watt-hour meters, 250,000 lb. weatherproof wires and cables, 161 overcurrent relays and a quantity of current transformers. Construction projects are as follows:

The Western Packing Provision Company, Chicago, plans a plant to cost $185,000. The Sanitary District of Chicago is planning a power substation, near Western Avenue Terminal to cost $75,000. The Toledo, Peoria & Western Railroad, Toledo, Ohio, will build an engine house and shops at East Peoria, Ill., to cost $100,000. The Central Illinois Public Service Company, Springfield, Ill., is planning an equipment storage and distributing plant to cost $55,000. The Penberthy Injector Company, Detroit, plans an addition to cost $100,000. The Fountainway Corporation, Cincinnati, Ohio, plans a factory to cost $90,000. Steel & Tubes, Inc., Cleveland, plans a plant at Ferndale, Mich., to cost $750,000. The Puritan Dairy, Inc., Beloit, Wis., plans an ice cream plant to cost $85,000. Austin, Minn.; Biwabik, Minn.; Lincoln, Neb., and Madison, Wis., plan ornamental lighting systems. New Ulm, Minn., will soon ask bids for an improved lighting system. Neenah, Wis., will ask bids about July 1 for an ornamental lighting system.

Small Orders in Good Volume Mark New England Sales

Sales of electrical equipment in the New England district were steady and the volume good, according to reports from several manufacturers. Small motor sales were strong. A number of 50-hp. and larger motors were placed. Negotiations for heavy equipment are promising, especially for turbo-generators. Small switches and power apparatus sales were encouraging; in fact, the trend appears stronger in this line. Orders for about $8,000 worth of control equipment were received from a Massachusetts mill, and smaller orders are quite numerous. A number of loom motors were ordered and contractors' equipment is in good demand. An order for a 145-hp. motor and control for rock-crushing machinery is noted and two laundry installations are of interest, including motor drives throughout amounting to over $5,000 in electrical equipment.

Specialties are attracting interest. Arc welders are being considered for assembly work in tool machines with attention, in particular, to new types of loom machinery. Eleven electric clocks, regulated from a master clock of the Boston Edison Company, will be installed in the new North Station. Electric refrigerators are gaining rapidly in popularity. Electric appliances show a substantial gain in volume. An important construction project reported is as follows:

The Grafton Power Company, Lebanon, N. H., plans a hydro-electric power plant on the Connecticut River, near Littleton, N. H., to cost $25,000,000.

Volume of Sales Up Despite Small Orders in Southeast

With the exception of a power transformer order, amounting to $125,000, from a power company in Alabama, no orders of moment are being placed by central-station companies in the Southeast except in connection with merchandising activities. A power company in Mississippi ordered small power transformers totaling $2,500 and a Georgia company ordered creosoted pine poles amounting to $2,000 and distribution transformers costing $1,100. Two municipalities in Georgia ordered four carloads of creosoted pine poles each. The total volume of business is holding up remarkably well, even though the bulk of orders is individually small.

Inquiries from industrial plants are on the increase and a satisfactory amount of business in this field is reported. One textile mill in Georgia has undertaken electrification and ordered $10,000 worth of motors and approximately the same amount in wiring materials. Two other cotton mills in the same state ordered motors and miscellaneous electrical equipment amounting to $7,000 and $6,000, respectively. Plans have been made for moving South a textile mill which will form the second unit of a Georgia mill and the wiring materials in this unit will approximate $25,000. Construction projects are as follows:

The Volunteer Knitting Mills, Athens, Ala., plan an addition to cost $100,000. The Alabama Power Company, Birmingham, Ala., has applied for permission to construct 200 miles of transmission lines in different parts of the state. The Louisville & Nashville Railroad Company, Louisville, Ky., will make improvements in repair shops and terminal at Mobile, Ala., to cost $125,000. The West Florida Power Company, Jasper, Fla., plans a transmission line from Quincy to Gretna, Fla., to cost $85,000. The Commodore Point Terminal Company, Jacksonville, Fla., plans an ice plant to cost $100,000. The Baker County Power Company, Newton, Ga., plans a steam power plant to cost $200,000. The Kentucky Utilities Company, Louisville, Ky., has acquired properties of the General Power & Light Company at Calhoun, Rumsey, Poole, Sebree, Ky., and plans transmission line construction, etc. The Mississippi Power Company, Gulfport, Miss., has acquired a power plant at Picayune, Miss., and plans new transmission lines. The company will also build transmission lines to Russell and Kewanee, Miss. Bennettsville, S. C., plans extensions in its municipal power plant. The Plough Chemical Company, Memphis, Tenn., plans an addition to cost $500,000.

Sign Business Especially Good in St. Louis District

No change in general conditions is reported in the St. Louis district. An order for transformers and substation equipment was placed at a cost of $3,500. The electric sign manufacturers report the demand is holding up unusually well. Orders for small motors and transformers continue about normal. Fan business has been good and all appliances are moving in good volume. Construction projects are as follows:

The Wilson Power & Light Company, Wilson, Ark., plans extensions in its power plant and system, to cost $100,000. The Eldorado Refining Company, Eldorado, Kan., will build an oil refining plant to cost $100,000. The Satanta Terminal Elevator Company, Satanta, Kan., plans a grain elevator, to cost $100,000. The Gulf Public Service Company, New Iberia, La., is negotiating for the purchase of municipal power plant at Lafayette, La., and plans extensions and transmission line construction. The West Coast Kalsomine Company, San Francisco, plans a plant at New Orleans, La., to cost $85,000. The Page Milk Company, Merrill, Wis., plans a plant at Marshall, Mo., to cost $200,000. The Universal Cutter Company, St. Louis, plans a plant to cost $80,000. The St. Louis Smelting & Refining Company, New York, will build an ore mill at Quapaw, Okla.; to cost $125,000. The Burton Packing Company, Burton, Tex., plans a meat-packing plant at Houston, Tex., to cost $100,000. The Texas-Mexican Refining Company, Laredo, Tex., plans extensions in its oil

refinery to cost $125,000. Smith Brothers Properties, Inc., San Antonio, Tex., is planning a cement mill near the city to cost $1,000,000, and a power plant is projected. Waco, Tex., has authorized a fund of $3,500,000 for municipal waterworks. Jonesboro, Ark.; Fort Stockton, Tex.; San Antonio, Tex., and St. Louis, Mo., plan ornamental lighting systems. The Empire District Electric Company has concluded a contract with Joplin, Mo., for an ornamental lighting system.

Many Equipment Orders Placed on Pacific Coast

Power companies and industrial plants, especially mining and lumber companies, bulk large in the week's orders on the Pacific Coast. The Utah Copper Company has bought four 1,000-kva. rotary converters and complete automatic substation equipment for its Bingham plant at a cost of $175,000. The Miami Copper Company of Miami, Ariz., has ordered a 15,625-kva. turbine, twelve locomotives, five 200-kva. transformers, three 150-hp. motors and a seven-panel switchboard at a value of $550,000. Power company ordering has included $4,500 worth of miscellaneous hardware, one-half carload of bare copper wire, etc. Prospective power company business includes 1928 pole requirements for the San Joaquin Light & Power Corporation, comprising 8,200 poles for delivery during September, October and November, with an estimated value of $115,000.

The Seattle City Council has authorized the immediate construction of the Spring Street substation to cost $1,000,000 complete. A contract was let by the British Columbia Electric Railway Company for the first 20,000-kw. turbo-generator unit for its Vancouver plant. A. Guthrie & Company, Portland, will construct the Leaburg unit of the Eugene-Oregon hydro-electric project at a cost of $1,029,230. A contract for two 7,500-kw. turbines costing about $230,000 was placed by the Weyerhauser Company for its lumber mill at Longview. Motor and transformer orders pending total $160,000. Construction projects are as follows:

The Big Jim Mines, Inc., Patagonia, Ariz., plans a milling plant to cost $100,000. The Wenden Copper Mining Company, Wenden, Ariz., plans a mill and reduction plant to cost $100,000. The People's Hydro-Electric Corporation, Alturas, Calif., plans a hydro-electric power plant on Pine Creek to cost $100,000. The Illinois-Pacific Glass Company, San Francisco, plans a plant at Vernon, near Los Angeles, to cost $300,000.

The Pacific Lumber Company, Scotia, Calif., plans a power project on the Eel River, Humboldt County, in connection with proposed pulp and paper mill to cost $2,000,000. The Commonwealth Utilities Corporation, Colorado Springs, Colo., plans a transmission line from the Manitou power plant to cost $30,000. The Farm Light & Power Company, Howell, Wyo., plans extensions in transmission lines. Los Angeles and Bakersfield, Calif., and Vancouver, Wash., are planning to add to their ornamental lighting systems.

Activities of the Trade

Malleable Iron Fittings Appoints General Sales Agent

Announcement has been made by the Malleable Iron Fittings Company, Branford, Conn., of the appointment of the Line Material Company, South Milwaukee, Wis., as general sales agent throughout the greater part of the United States for the pole hardware department of the company. The territory reserved for direct sales by the Malleable Iron Fittings organization consists of all the New England states, Westchester County and Metropolitan New York, including Long Island, Staten Island and the five northeasterly counties of New Jersey. The company manufactures Williams pole mounts, reinforcing and extension clamps for tubular iron poles, cable suspension clamps, catenary clamps, wood pole top extensions and other pole hardware.

Salesmen and Purchasing Agents Elect Officers

A. H. Jones, Bryant Electric Company, Bridgeport, Conn., was elected president of the Salesmen's and Purchasing Agents' Association of America at a recent meeting. At that time R. T. Phipps, Bullard Machine Tool Company, Bridgeport, was chosen vice-president; W. B. Osborne, Erie Malleable Iron Company, Erie, Pa., secretary, and W. H. Bradley, Hunter & Havens, Bridgeport, treasurer.

R. T. Phipps, past treasurer, was given a gold watch and chain in recognition of his work in promoting the first exhibition of the association. It is expected that a second exposition will be held in Bridgeport early in 1929. The retiring president, H. J. Behn, Hunter & Havens, Bridgeport, also was given a unanimous vote of thanks.

Economy Fuse Buys Federal Fuse Business

The purchase of the "Federal National" renewable fuse department, including all material, physical property, patents and good will of the "Federal National" renewable fuse from the Federal Electric Company of Chicago, has been announced by the Economy Fuse & Manufacturing Company of Chicago. The Economy company is already under complete production and will market this fuse under the trade name "National." The company states that slight modifications in the original design of the fusible element have been made. The National renewable cartridge fuse is now listed as standard in all capacities up to 600 amp. in both the 250 and 600-volt types in the April, 1928, list of inspected electrical appliances, under the label service form of supervision by the Underwriters' Laboratories.

The plan of the company in marketing the "National" fuse will be to serve the users, contractors and dealers through the electrical wholesalers under a plan similar to its policy in the marketing of Economy renewable cartridge fuses. The company also announces that T. D. Halliwell, formerly manager of the wiring device and thermal control sections of the Westinghouse Electric & Manufacturing Company in its merchandising department at Mansfield, Ohio, has been appointed assistant to the president.

THE BUFFALO FOUNDRY & MACHINE COMPANY, Buffalo, N. Y., manufacturer of driers, evaporators and chemical equipment, announces the opening of an office in San Francisco, in charge of Charles O. Lavett.

THE O. C. WHITE COMPANY, Worcester, Mass., manufacturer of adjustable electric light fixtures, announces the appointment of James A. Vaughan, 1104 Packard Building, Philadelphia, as its representative in the Philadelphia territory.

THE OHIO ELECTRIC & CONTROLLER COMPANY, Cleveland, manufacturer of lifting magnets and small motors, announces the appointment of the Charles L. Ward Company, 701 Midland Building, Kansas City, Mo., as its representative in Kansas City; Omaha, Neb.; Dallas, Tex., and the territories adjacent to these cities. J. Dale Reynolds, Apartado 428 Monterey M. L., Mexico, has been made the company's representative in Mexico.

BAKER & SPENCER, INC., 117 Liberty Street, New York City, engineers, announce that after June 1 their address will be 17 Battery Place, New York City.

LANDERS, FRARY & CLARK, New Britain, Conn., manufacturers of appliances, announces the "Universal" vacuum auto cleaner, which also is adapted for use in stores, offices, etc., and as a complement to the regular cleaner in the home.

KLIEGL BROTHERS, 321 West Fiftieth Street, New York City, manufacturer of stage-lighting equipment, announces that electromagnetic operation of color frames on Kliegl spotlights is now available.

CURTIS LIGHTING, INC., Chicago, manufacturer of "X-Ray" reflectors, announces the appointment of Roy D. Myers as resident engineer for northern California with offices at 414 Foxcroft Building, San Francisco. Mr. Myers has been in charge of the lighting service bureau of the Northern States Power Company, St. Paul, Minn., for the past nine years.

New Equipment Available

Insulation Which Can Be Punched Cold

Improvement in the punching grades of Formica, manufactured by the Formica Insulation Company, 4638 Spring Grove Avenue, Cincinnati, has now made it practical to shear the stock cold and punch it cold up to and including ¾ in. thick. The material is available in natural brown or black colors. The manufacturer claims that this workability has been attained in a stock that has been fully cured. There is no increase in price for the material as compared to the former grade. A sample can be secured from the manufacturer for testing.

Corrosion-Proof Coating

A corrosion-resisting coating which the manufacturers claim can be applied economically and which has been successfully applied to products ranging from battery handles to copper conductors and various classes of sheet metal is being offered by the "Amaloy" division of the American Machine & Foundry Company, 511 Fifth Avenue, New York. Any metal subject to corrosion may be Amaloy-coated. Amaloy is a single continuous coating of practically pure lead which forms a chemical bond with the coated metal without alloying or impregnating it. It is said to form a perfect corrosion-proof adherent incasement that will not crack, check or split off the base metal.

In a test conducted at the New York Testing Laboratories two identical 6-in. wrought-iron pipe nipples were submerged in a bath of 18 per cent by weight sulphuric acid for 44 hours after one had been coated with Amaloy and the other had been coated with zinc spelter galvanized in the same manner as commercial galvanized pipe. At the end of the test the Amaloy-coated pipe showed a loss by weight of 1.6 grains. The galvanized pipe showed a loss of 134 grains.

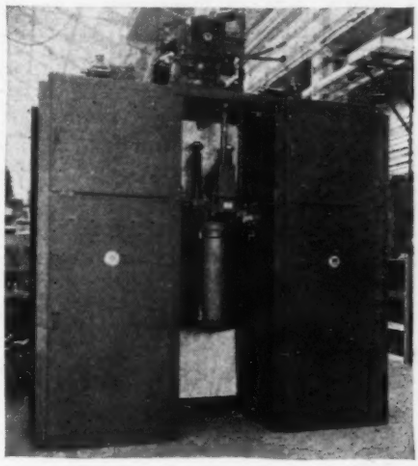
Portable Air Compressor

A new size of portable air compressor has been placed on the market by the Ingersoll-Rand Company, 11 Broadway, New York. This makes the seventh size in the company's line of its portable air compressors. This new size, 4¾-in. bore by 4-in. stroke, has a piston displacement of 82 cu.ft. per minute. It is intended primarily for use by contractors, public utilities, cities, towns, etc., requiring a unit of slightly larger capacity than the 4¼-in. x 4-in. machine.

The new compressor, like the other I-R portables, is equipped with a four-cylinder, tractor-type Waukesha motor. It is available on broad-faced steel wheels, on steel wheels with rubber tires, on I-R trailer mounting, on Ford or Chevrolet truck, or without running gear for mounting on skids, railway cars, etc. This unit embodies all the Ingersoll-Rand features which are found on the other six sizes.

Steel Structures for Circuit Breakers

A circuit breaker mounted in a fabricated steel structure designed to replace the concrete has been developed by the Westinghouse Electric & Manufacturing Company. The circuit breaker is built complete at the factory. The company states that time and expense of installation are materially reduced by using the steel structure because the building of forms, the pouring of the concrete and the cleaning up for installation of



Circuit breaker mounted in a fabricated steel structure designed to replace a concrete cell

apparatus are eliminated. The time of preparing for service is materially reduced because of the unit construction of the apparatus, which also is shipped as a unit. It is only necessary to put the breaker in place, bolt it down, remove the blocking, check the adjustments, connect it to the control circuits and the bus, put in the oil and it is ready for service.

The steel structure, the company claims, is better suited for this service in that the operation of the breaker imposes shocks on the supports. Steel, by its elastic characteristics, absorbs the shocks easily with no damage to itself. Although the structure shown exactly replaces a concrete structure, it is possible to reduce the space occupied by taking advantage of the greater strength of the steel. The steel frame is lighter than the concrete structure, which results in an indirect saving in that the floors and main building can be lightened because of the decreased load carried. In the structure shown the circuit breaker only is supported. The use of steel can be extended to support the disconnecting switches and further to support the bus, with corresponding savings.

Portable Instruments

A new line of portable alternating and direct-current instruments has been placed on the market by the Westinghouse Electric & Manufacturing Company. The alternating-current instruments are designated as the type PY5. They are of the direct-reading type and are applicable for general testing and laboratory work where high accuracy is required. The voltmeters and single-phase wattmeters are of the electrodynamometer type. The ammeters are of the moving iron type using vanes of non-residual metal. All instruments are shielded and are damped by an improved design of air damper. The ammeters have a double range which can be changed while the meter is in use by a series-parallel switch mounted in the case. They may be used on circuits up to 500 cycles and also on direct current with but slight reduction in accuracy.

The direct-current instruments are known as the type PX2 and are particularly suitable for automobile, battery, radio and miscellaneous testing. They are of the permanent magnet moving-coil type and operate on the D'Arsonval principle. This line of instruments includes millivoltmeters, double-range voltmeters, milliammeters, ammeters, radio frequency ammeters and galvanometers.

RENEWABLE CARTRIDGE FUSE.—A redesigned line of renewable cartridge fuses has been placed on the market by the Star Fuse Company, 235 Canal Street, New York. The fuses are said to be simple in construction and from the smallest to the largest size can be assembled without the use of tools. The renewable element is inclosed in a fiber tube. The company also claims that by reason of this construction a pressure, which is created in the refill, chokes the arc formed when a fuse blows on a short circuit.

CRANE PANELS.—The revision of its line of crane protective panels bearing the designation CR-7409 is announced by the General Electric Company. Such panels provide overload and undervoltage protection for all the motors of a crane and are designed to be used with an emergency switch for use by the operator in an emergency. They may be used with either drum switches or magnetic control panels. The principal change in the revised line is a regrouping of the units involved, resulting in a decided reduction in total size. Another change is the substitution of instantaneous overload relays instead of dashpot overload relays. Otherwise the equipment is practically the same as before, except that up-to-date material is used in all cases.

Electrical Patents

Announced by U. S. Patent Office

*1,669,112. SUPERVISORY CONTROL SYSTEM; F. H. Winter, Schenectady, N. Y. App. filed Sept. 15, 1924.

(Issued May 15, 1928)

1,670,218. MEANS FOR PREVENTING CURRENT LEAKAGE IN ELECTRIC CABLES; H. R. Searing, New York, and E. Williams, Jackson Heights, N. Y. App. filed March 11, 1927. Insulation of high tension cables.

1,670,227. OIL-IMMERSED ELECTRIC SWITCH; W. Anderson, Herburn-on-Tyne, England. App. filed Nov. 22, 1926.

1,670,237. ELECTRICALLY HEATING THE ENDS OF ROCK DRILLS AND THE LIKE; B. D. Bushell, Springs, S. E. T. Ewing, Johannesburg, and E. H. D. Brunner, Springs, Transvaal, South Africa. App. filed Aug. 7, 1926.

1,670,259. ELECTRICAL CONDUIT FITTING; J. J. Heribauer, New York, N. Y. App. filed Sept. 28, 1926.

(Issued May 22, 1928)

1,670,292. TUNGSTEN FILAMENT AND METHOD OF MAKING IT; F. Blau, F. Koref and K. Moers, Charlottenburg, Germany. App. filed Nov. 29, 1924.

1,670,334. TERMINAL FOR BUSHING INSULATORS; A. O. Austin, Barberton, Ohio. App. filed July 29, 1922.

1,670,419. BLASTING GUN; W. S. Mayer, Philadelphia, Pa. App. filed March 6, 1924. With means for furnishing an electric current.

1,670,429. PIN FOR INSULATORS; J. P. Arndt, South Milwaukee, Wis. App. filed Dec. 31, 1920. Which may be arranged in different positions on the cross arm and can be used on cross arms of different sizes.

1,670,437. ELECTRICALLY-HEATED STEAM BOILER; C. W. Campbell, Denver, Colo. App. filed April 8, 1926.

1,670,439. MOTOR CONTROLLER; F. F. Dorsey, Rochester, N. Y. App. filed April 30, 1924. As used with a power-driven typewriter.

1,670,506. ELECTRIC WATER HEATER; A. Johnson, Oakland, Calif. App. filed April 6, 1927. Wherein a relatively small quantity of the total storage capacity may be maintained highly heated for use when desired, or by the operation of a valve the entire capacity of the heater may be maintained at a high temperature.

1,670,581. CONTINUOUS-CURRENT VARIABLE-SPEED MACHINE; F. Kesselring, Furth, Germany. App. filed April 6, 1927.

1,670,585. CONTAINER FOR GRANULAR DEPOLARIZERS AND PROCESS OF MAKING THE SAME; G. A. Lyon, Miami, Fla., R. W. Erwin, Flushing and G. W. Heise, Bayside, N. Y. App. filed Jan. 5, 1923.

1,670,590. DRY CELL; J. J. McCann, Kearny, N. J. and C. G. Birdsall, Elmhurst, N. Y. App. filed Aug. 26, 1924.

1,670,604. DRY-CELL LINING; V. Yngve, South Orange, N. J. and W. E. Vail, New York, N. Y. App. filed April 6, 1925.

1,670,634. BATTERY CONNECTION; G. J. Ocker, Troxelville, Pa. App. filed June 24, 1925. For the terminal posts of a storage battery.

1,670,640. CONDUCTIVITY CELL; I. B. Smith, Ambler, Pa. App. filed May 20, 1925. For measuring the resistivity or conductivity of materials whose resistance change with temperature as an electrolyte.

1,670,649. CIRCUIT BREAKER; L. L. Brown, Spokane, Wash. App. filed July 12, 1927. Of the foot operated type, designed for use as a portable switch mechanism in an electric lamp circuit.

1,670,662. HOISTABLE COMBINED DISCONNECTING SWITCH AND FUSE FOR OUTDOOR TRANSFORMERS AND TRANSMISSION LINES; E. Johnson, Partille, Sweden. App. filed Jan. 14, 1924.

1,670,682. SIGNALING DEVICE; C. A. B. Halvorson, Jr., Lynn, and R. B. Hussey, Swampscott, Mass. App. filed March 14, 1923. Adapted for signaling to or from aeroplanes.

1,670,697. ELECTRICAL APPARATUS; E. D. Treanor, Pittsfield, Mass. App. filed April 6, 1926. Safety appliance for encased electrical apparatus such as transformers filled with an inert gas under heavy pressure. Safety appliance responsive to variations in the gas pressure.

1,670,699, 1,670,700. ELECTRIC WELDING; J. M. Weed, Scotia, N. Y. Apps. filed April 28, 1925, and July 29, 1927.

*Issued May 8, 1928.

1,670,716. HEAT DEFLECTOR FOR INCANDESCENT LAMPS AND SIMILAR DEVICES; J. F. Donovan, Cleveland, Ohio. App. filed Nov. 12, 1923.

1,670,746. THERMOSTATICALLY-CONTROLLED MECHANISM; O. C. Schroeder, Chicago, Ill. App. filed Nov. 19, 1924. As embodied in an oil burner structure.

1,670,759. ELECTRICAL DEVICE; J. Berg, Chicago, Ill. App. filed April 21, 1923. Extension cord on reel take up.

1,670,767. ELECTRIC WATER HEATER; A. A. Grassi and R. de O. Cézar, Buenos Aires, Argentina. App. filed Aug. 30, 1926.

1,670,792. METHOD OF AND APPARATUS FOR CHECKING THE CONNECTIONS OF WATT-HOUR METERS TO THE INSTRUMENT TRANSFORMERS AND TO THE LINE; W. C. Woodson, Jr., Brooklyn, N. Y. App. filed Sept. 1, 1927.

1,670,793. PROGRAM DEVICE; J. W. Yates, Cincinnati, Ohio. App. filed Dec. 21, 1921. For ringing a bell at desired intervals.

1,670,819. FUEL IGNITER; W. L. Morris and W. K. Booth, Chicago, Ill. App. filed Sept. 11, 1922.

1,670,824. MOTOR-POWER REVERSE GEAR; R. S. Roth, Fond Du Lac, Wis. App. filed July 21, 1925. For locomotives.

1,670,846. ZONED RESISTOR FOR ELECTRIC FURNACES; F. T. Cope, Salem, Ohio. App. filed Feb. 24, 1925.

1,670,856. CONTROL PANEL; G. W. Hyser, Minneapolis, Minn. App. filed June 18, 1927. For theater lighting.

1,670,897. BRAKE-MAGNET ADJUSTMENT; R. Mercier, Paris, France. App. filed July 22, 1925.

1,670,922. ELECTRIC SWITCH; C. E. Anderson, Stratford, Conn. App. filed May 18, 1921. Multiple switches, lever type, assembled to independently control a group of circuits.

1,670,985. ELECTRIC PROTECTION OF TRANSFORMERS; G. L. Porter, Benton, England. App. filed April 13, 1925. Using "split conductor protection."

1,670,998. SINGER; H. C. Vollmer and G. H. Repke, Flint, Mich. App. filed May 23, 1927. Electric hair singer.

1,671,016. STORAGE-BATTERY TERMINAL; F. G. Dewey, Anderson, Ind. App. filed Dec. 13, 1924.

1,671,026. ELECTRIC FURNACE; C. H. Gage, Washington, D. C. App. filed Feb. 12, 1926. Continuous feed type.

1,671,033. GAS AND ELECTRIC DRIVE FOR VEHICLES; C. I. Kimura, Chicago, Ill. App. filed Dec. 22, 1925.

1,671,046, 1,671,047. HYDRO-ELECTRIC INSTALLATION; A. Pfau, Milwaukee, Wis. Apps. filed Sept. 6, 1921, and April 1, 1922. Where the hydraulic machine is operative under or against a widely varying head.

1,671,068. ELECTRICAL SYSTEM; E. I. Deutsch, Milwaukee, Wis. App. filed April 20, 1918. An electrical generator in which the voltage is kept constant and in which a constant maximum speed is obtained by substantially limiting the speed so that it cannot exceed a given value.

1,671,076. INDUCTION-MOTOR-CONTROL SYSTEM; F. Jeffrey, Milwaukee, Wis. App. filed May 29, 1920. Where the control is exercised through a rotary converter and a direct current machine interconnected with the induction motor.

1,671,077. SYSTEM OF DISTRIBUTION; J. J. Kane, Milwaukee, Wis. App. filed July 24, 1915. Device for regulating generators connected to supply variable loads, especially where there is a tendency for a generator to operate at widely different speeds.

(Issued May 29, 1928)

1,671,145. ELECTRIC REGULATION; J. L. Creveling, Tucson, Ariz. App. filed April 3, 1917. For generator used in railway car lighting.

1,671,173. PROCESS AND DEVICE FOR THE PROTECTION OF METALLIC PARTS AGAINST CORROSION; F. von Wurstemberger, Zurich, Switzerland. App. filed April 30, 1924.

1,671,196. ELECTRIC SWITCH; W. J. Larson, West Hartford, Conn. App. filed Jan. 25, 1927. Push and pull type, adapted to be applied to a panel for testing electric apparatus, such as relays, meters and other instruments.

1,671,218. MOTOR CONTROLLER; W. O. Baer, Milwaukee, Wis. App. filed March 5, 1925. For synchronous motors.

1,671,226. LAMP SOCKET; L. Caruso, Irvington, N. J. App. filed Oct. 2, 1925. Combined lamp socket and supporting bracket suitable for holding miniature lamps.

1,671,229, 1,671,230. COMPOSITION MATERIAL ADAPTED TO THE PLASTIC ART; C. F. Chosa, Milwaukee, Wis. Apps. filed June 18, 1923.

New Trade Literature

SWITCHING AND PROTECTIVE EQUIPMENT.—The Hi-Voltage Equipment Company, Cleveland, has issued bulletin No. 15 covering a complete line of 132,000-volt switching and protective equipment. This bulletin contains illustrations showing various installations, and different types of the equipment. Drawings and operating data also are included.

CONTROL APPARATUS. — "Keeping Pace in the Newspaper Plant" is the title of a catalog issued by the Cutler-Hammer Manufacturing Company, Milwaukee. The catalog contains descriptions of the function and the operation of the press control, press drives, newspaper conveyors, etc., developed by the company. It also gives the advantages of each particular style of apparatus and shows how large and small plants alike are using the equipment to best advantage. Many illustrations showing actual installations are included.

ELECTRIC EQUIPMENT FOR GRAIN ELEVATORS, ETC.—The General Electric Company, Schenectady, N. Y., is distributing the following bulletins: GEA-767A, covering the new totally inclosed fan-cooled grain elevator motors, GEA-882, covering direct-current, induction and synchronous motors and control particularly adopted to plate-glass manufacture; GEA-883 covering equipment for bottle-glass plants; GEA-955, describing electric equipment for cotton gins and GEA-241A describing oil well pumping equipment.

ELECTRIC WATER HEATERS.—Reports of electric water heating tests on low wattage heaters conducted by the Russell Sage Laboratory of the Rensselaer Polytechnic Institute, Troy, N. Y., has been issued by the Hynes & Cox Electric Corporation, Albany, N. Y. It contains information and data with performance charts of the "Red Crown Duostat" electric water heater on which the tests were made.

INSTRUMENTS AND LIGHTING ARRESTERS.—Bulletin GEA-402A issued by the General Electric Company, Schenectady, N. Y., covers its direct-current miniature portable instruments and bulletin GEA-93B covers the pellet-type oxide film lightning arresters.

GROUND RESISTANCE TESTER. — "Measurement of the Resistance to Earth of Ground Connections" is the title of technical bulletin No. 1185, issued by James G. Biddle, 1211 Arch Street, Philadelphia, covering the "Megger" ground resistance tester. The bulletin includes a description of the new direct-reading "Megger" ground resistance tester, comparison of various methods of test and data on the characteristics of earth.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Hamburg, Germany (No. 31,668), of flash-light batteries.

Purchase and agency are desired in La Guaira, Venezuela (No. 31,652), for automobile storage batteries.

An agency is desired in Wellington, New Zealand (No. 31,676), for household electrical appliances.

An agency is desired in Merida, Mexico (No. 31,655), for household refrigerators.

Purchase and agency are desired in Johannesburg, South Africa (No. 31,670), for household refrigerators.

Purchase is desired in Newcastle, England (No. 31,669), of traffic signals and devices.

An agency is desired in Edmonton, Canada (No. 31,673), for turbo-generator sets and mercury are rectifiers.

An agency is desired in Leipzig, Germany (No. 31,672), for domestic washing machines.

An agency is desired in Toronto, Canada (No. 31,671), for enameled magnet wire.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

Copper Consumption Reflects Electrical Progress

NEARLY 200,000 tons of copper were consumed in electrical manufacturing during 1927. Telephones and telegraphs used another 93,000 tons. Light and power lines for transmission and distribution, together with trolley wire, called for 108,000 tons. Electrical applications of one sort or another therefore account for almost half—that is, for 397,800 tons—of the 834,500 tons consumed in this country last year. Of the electrical copper, roughly three-fourths went into power equipment and circuits, the remaining quarter into facilities for communication.

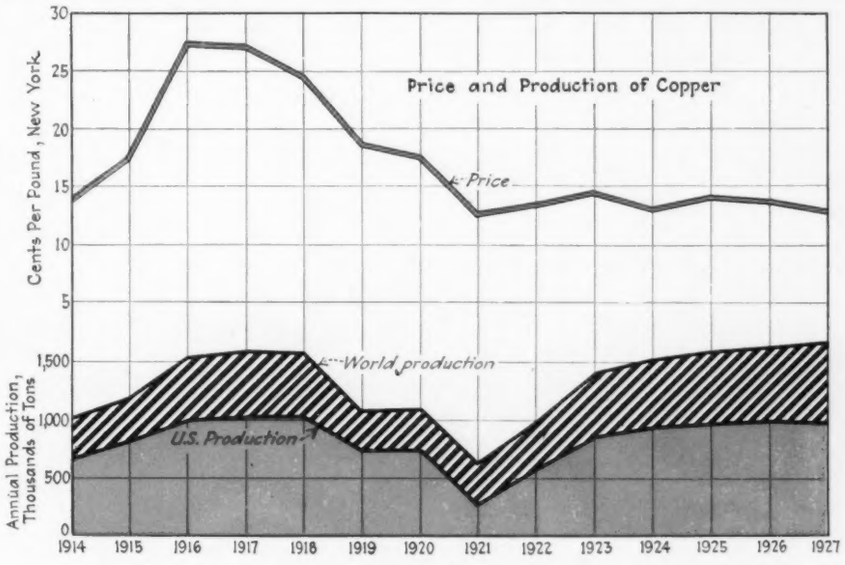
These statements are based on the estimates published in the 1927 Year Book of the American Bureau of Metal Statistics. If we add the 4,500 tons allocated to radio receiving sets, 750 tons to steam railways electrified, with perhaps a small fraction of the 46,100 tons used in buildings, plus roughly 11,000 tons used in electrical exports, it seems clear that fully half of the consumption of the metal goes into electrical applications.

The major electrical uses for the years 1920 to 1927 are given in the accompanying table. The annual consumption for electrical manufacturing as well as that for telephones and telegraphs has trended upward, the latter more than the former.

The greatest change is in the item of light and power lines. This shows a fourfold increase from 1920 to 1926, followed by a recession in 1927. The extensive building of transmission lines and interconnections in recent years is well known. The taking on of nearly 11,000,000 new customers called for vast extensions of primary and secondary lines, with corresponding quantities of inside wiring. These movements are reflected in the statistics of copper consumption.

Meanwhile the ratio between electrical and other uses has been remarkably constant for seven years, the former never deviating far from 47 per cent of the total. Evidently electrical manufacturing and construction run parallel with other copper-using activities; totals rise and fall, but the ratio remains steady.

Because of storage, of the natural time lag between production and consumption and of the use of considerable quantities of scrap, consumption figures are not comparable, year by year, with those of production. Thus, after the war accumulation and the descent from war prices, production in the United States fell from 635,248 tons in 1920 to less than half as much, 238,420 tons, in 1921. The decrease in consumption was far less drastic. During recent years production in the United States has approximated 60 per cent of the world's output. The yearly average of prices as shown by the New York market has varied only moderately since 1921.



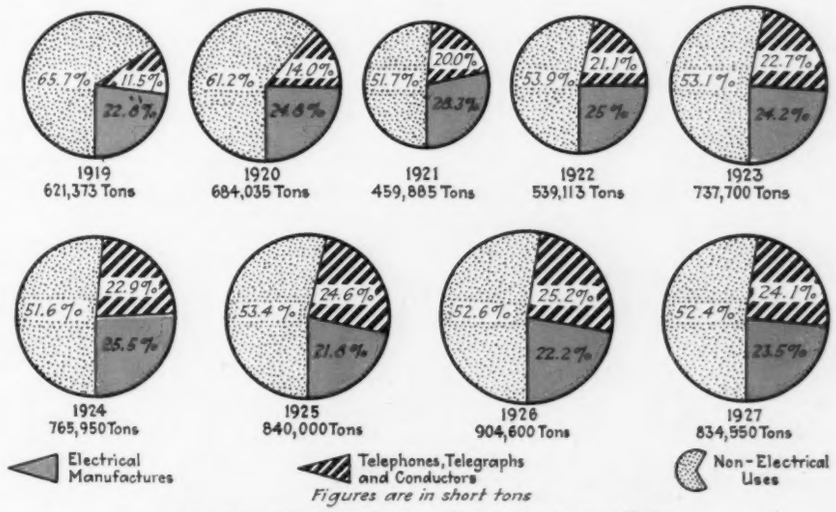
United States produced nearly 60 per cent of world's copper

ESTIMATED CONSUMPTION OF COPPER IN THE UNITED STATES*

(In tons of 2,000 lb.)

Year	Electrical Manufactures	Telephones and Telegraphs	Light and Power Lines	Trolley Wire
1920	170,000	61,000	29,500	5,400
1921	130,000	54,000	33,000	5,200
1922	134,500	60,000	48,750	4,600
1923	178,500	75,000	85,850	6,250
1924	195,500	80,000	90,000	5,100
1925	183,500	90,000	110,000	6,650
1926	201,000	104,000	117,000	7,000
1927	196,500	93,000	103,000	5,300

*Year Book, American Bureau of Metal Statistics



Figures are in short tons

Allocation of Copper Consumption in the United States

Half the copper is used for electrical purposes

Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers to quote or use them for any legitimate purpose. While no acknowledgment is required, users will, by crediting the ELECTRICAL WORLD, help it in obtaining and compiling further basic information.

Production in Middle Atlantic States Continues High

PRODUCTIVE operations of the manufacturing plants in the Middle Atlantic States continued on a high plane during May, according to basic data received on electrical energy consumption by about 400 large manufacturing plants operating in the section. Ever since last November the operations of the manufacturing plants in this section have been above those for the same month in the year previous, the peak of activities being reached in February, during which month the rate of operations was about 12.5 per cent above February, 1927. In May the rate of operations was about 1.6 per cent above April and 4.6 per cent above May last year.

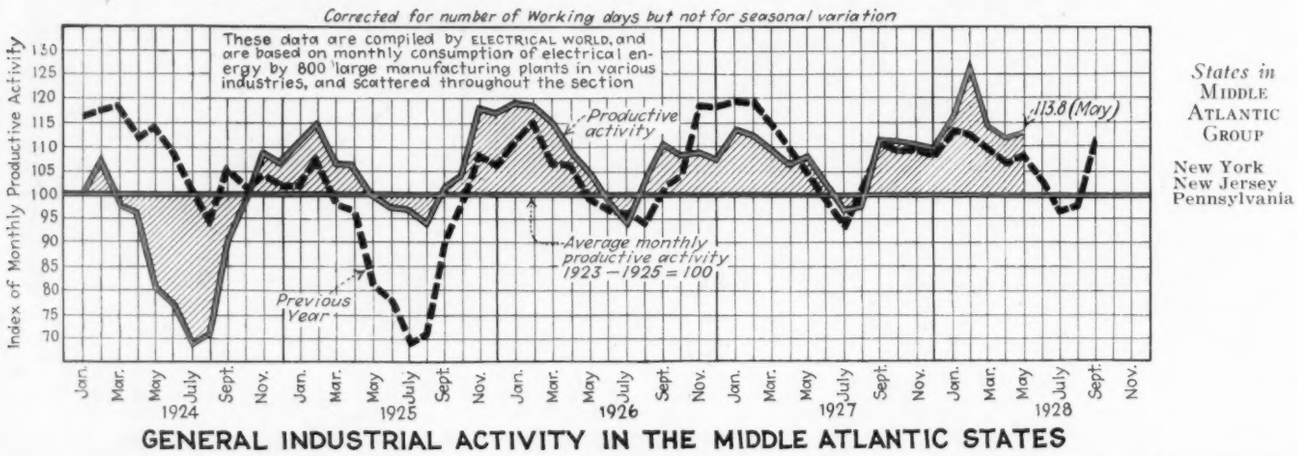
During May seven of the section's primary industries—automobiles, chemicals and allied products, food and kindred products, leather and its products, ferrous and non-ferrous metal-working plants, rolling mills and steel plants, and textiles—witnessed productive activities materially over those reported for May, 1927. On the other hand, three industrial groups—lumber and its products, paper and pulp, and the stone, clay and glass group—reported rates of operations under those of last year.

Indexes of Productive Activity in the Middle Atlantic States

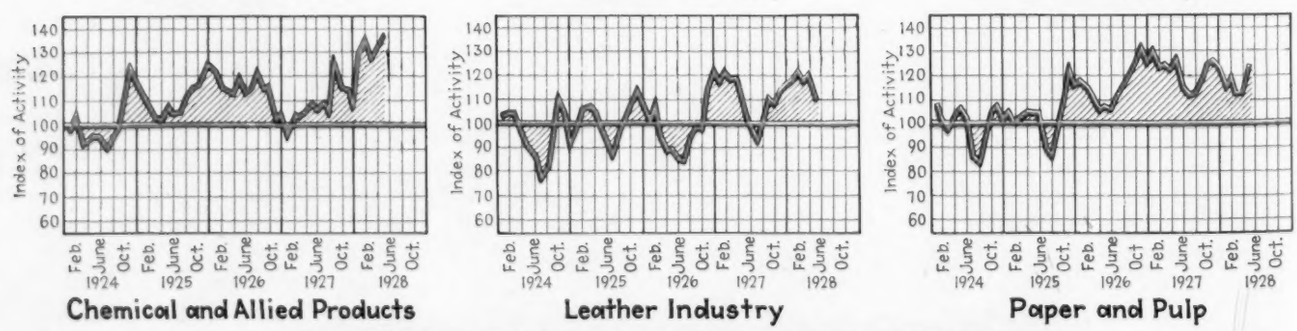
All Figures Adjusted for Number of Working Days

	May, 1928	April, 1928	May, 1927	Average First Five Months 1928	Average First Five Months 1927
All industries	113.8	112.0	108.8	116.5	110.1
Automobile	169.6	171.2	121.6	167.0	103.9
Chemical and allied products	135.6	133.4	109.3	131.9	103.6
Food and kindred products	100.8	92.4	90.4	96.9	.....
Leather and its products	110.0	120.9	105.8	117.9	116.7
Lumber and its products	104.8	104.5	159.5	106.4	.....
Metals group	109.8	109.1	106.6	112.5	109.9
Rolling mills and steel plants	111.6	108.4	106.6	113.8	109.9
Metal fabricating plants (ferrous and non-ferrous)	108.0	109.9	.....	111.3	.....
Paper and pulp	123.8	112.5	129.5	116.1	126.9
Stone, clay and glass	112.6	124.3	120.4	115.1	.....
Textiles	106.7	104.0	105.3	114.9	110.8

ELECTRICAL WORLD *Barometer of Industrial Activity in the Middle Atlantic States*


Corrected for number of Working days but not for seasonal variation
These data are compiled by ELECTRICAL WORLD, and are based on monthly consumption of electrical energy by 800 large manufacturing plants in various industries, and scattered throughout the section
Index of Monthly Productive Activity
Productive activity
113.8 (May)
Average monthly productive activity 1923—1925 = 100
Previous Year
States in MIDDLE ATLANTIC GROUP
New York
New Jersey
Pennsylvania
1924
1925
1926
1927
1928

GENERAL INDUSTRIAL ACTIVITY IN THE MIDDLE ATLANTIC STATES



PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE MIDDLE ATLANTIC STATES